

Tuberculosis (TB) Avian tuberculosis (ATB)

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Definition

- It is a contagious chronic disease caused by *Mycobacterium avium* characterized by unthriftiness, decreased egg production, and finally death

Economic losses

- TB in commercial poultry is rare, but still occurs sporadically in backyard and game birds.
- TB remains problem in captive exotic birds causing severe losses in zoo aviaries.
- *M. avium* infections have been common in patients with acquired immune deficiency syndrome.

The cause

- The most common cause of avian tuberculosis in chickens is *M. avium* serovars 1 and 2
- *M. avium* is acid fast bacilli, club, curved with rounded ends, non spore former aerobic and non motile.
- The organism grows well at temperature range 39- 45°C and some strains of ATP required glycogen or mycobactin as a growth factor.
- In primary isolation, the growth is enhanced by 5-10% CO₂.
- Colonies on egg yolk media are small, slightly raised, discrete and grayish white in 10 days to 3 weeks.

Epidemiology

- Avian tuberculosis in chickens is caused by *M. avium* serovars 1, 2 and 3 are world wide in distribution.
- Avian tuberculosis is diagnosed rarely in commercial poultry.
- It has been diagnosed in small flocks.
- The explanation for this is not entirely obvious, although there are several possible contributing factors such as climate, flock management, and duration of infection.

Epidemiology

- The necessity of keeping birds closely confined during winter provides favorable conditions for the spread of the disease.
- TB is a problem in captive exotic and zoo birds due to:
- Management problems concerning control of the disease are magnified, because exotic species are often maintained for years.
- The ability of the *M. avium* to survive in the soil and the lack of adequate procedures for cleaning and disinfecting contaminated premises has become a major obstacle to the elimination of ATB from zoologic collections.

Transmission

- The main source of infection is the exudates from the tuberculus lesions especially that present in intestines of infected birds.
- Droppings may also contain the bacilli from the liver lesions and mucosa of the gall bladder which expelled out through the bile duct.
- The contaminated environment especially soil and litters is the most important SOI.
- *M. avium* has been isolated from eggs of naturally infected chickens but hatched chicks failed to develop ATB.

Clinical signs

- The bird will be less lively than its penmates.
- Easily fatigued and depressed.
- The appetite usually remains good.
- Progressive and sticking loss of weight (atrophy of the breast muscles with prominent keel) and the body fats disappear.,
- The face of the affected bird appeared smaller than normal.
- Ruffled feathers, pale comb and wattle and ear lobes are seen,

Clinical signs

- Occasionally, the comb and wattles have a bluish discoloration or ecchymotic in advanced hepatic damage..
- In many cases affected birds shows a unilateral lameness and walks with peculiar jerky hopping.
- Paralysis from tuberculosis arthritis can occur.
- With advanced emaciation, nodular masses can be palpated along the intestine.
- Severe diarrhea due to intestinal lesions.
- Sudden death may occur from haemorrhages of ruptured liver and

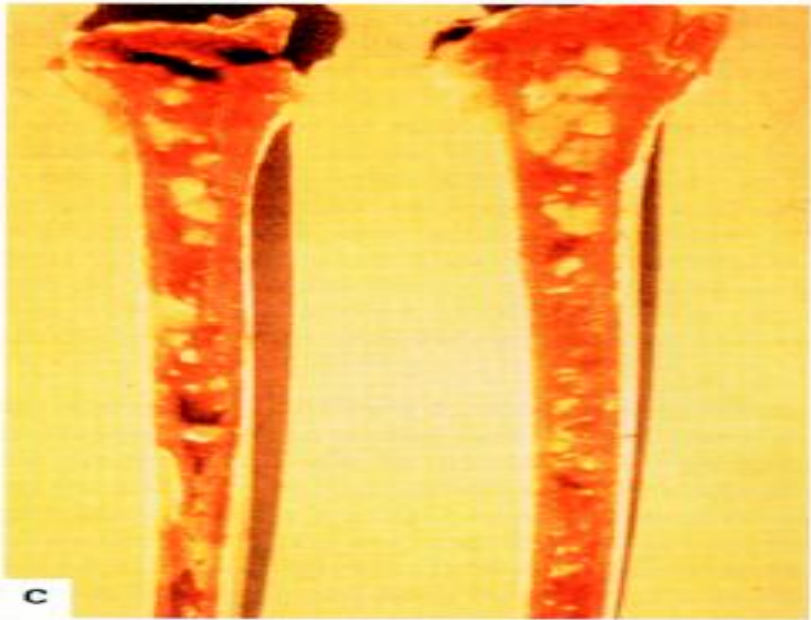
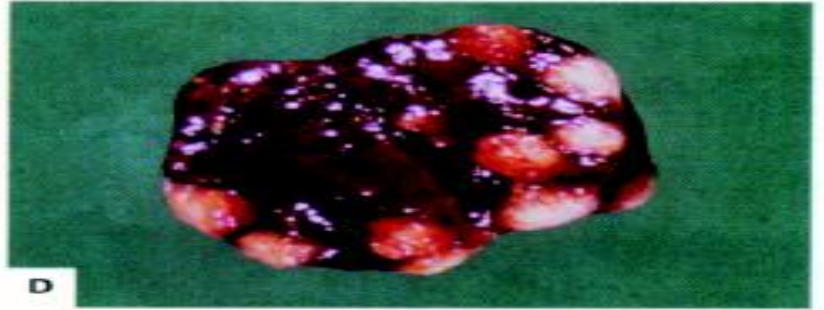
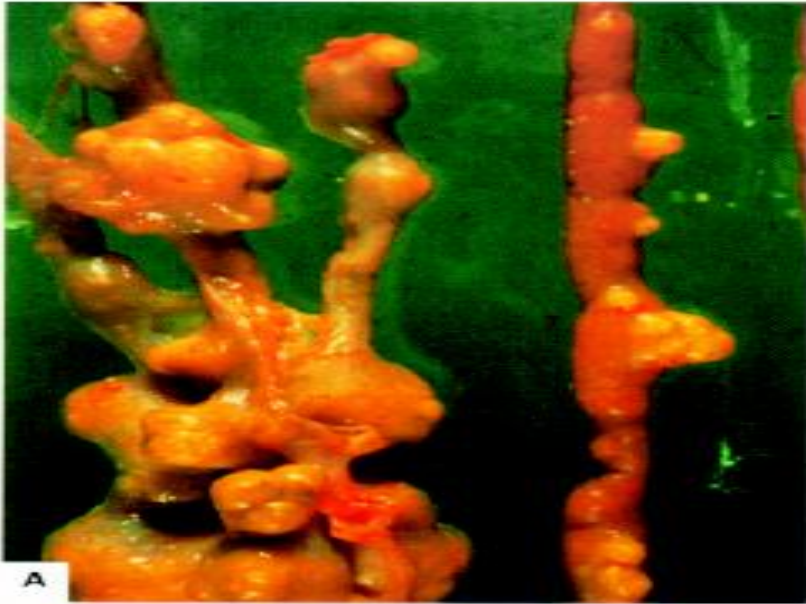
Lesions

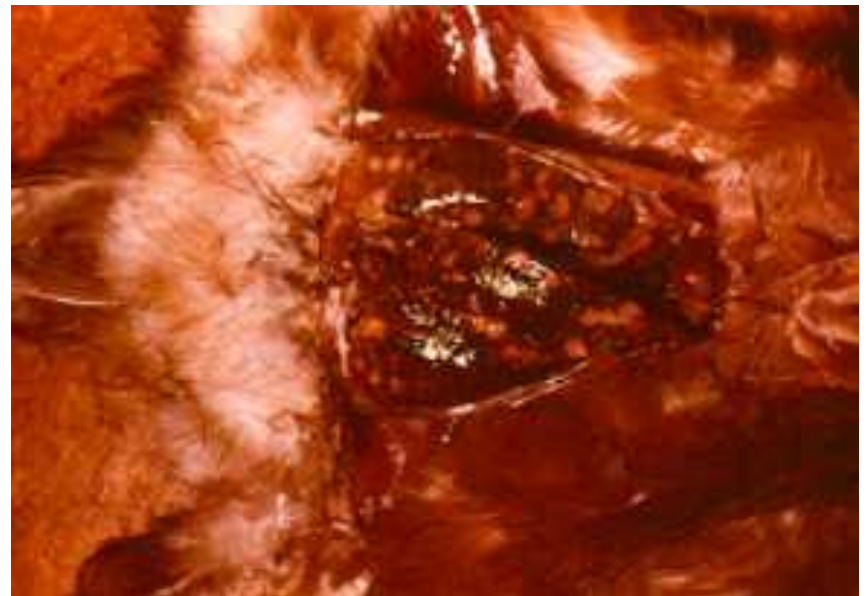
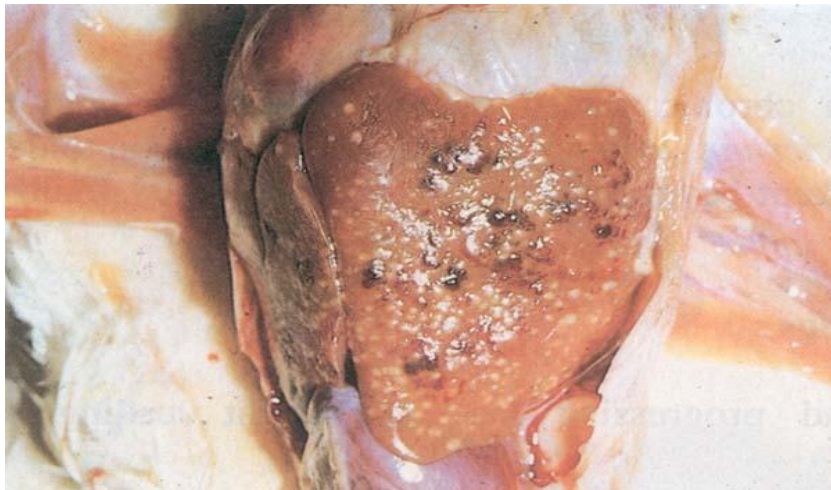
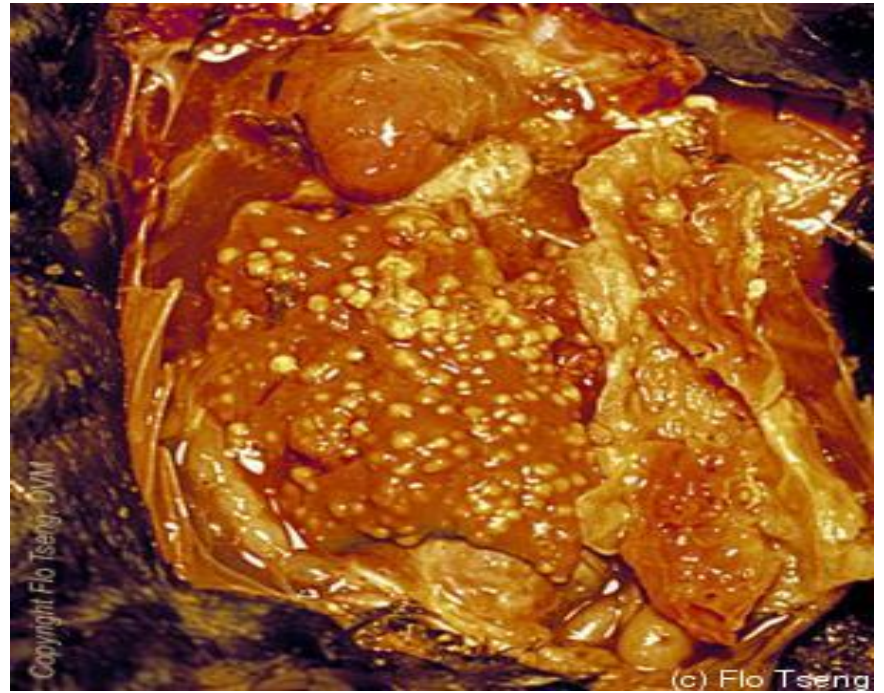
- Lesions are seen most frequently in liver, spleen, intestine and bone marrow.
- Lesions of ATB in chickens are characterized by pinpoint to several centimeters, irregular grayish yellow or grayish white nodules in liver, spleen, intestine.
- Enlarged and ruptured liver and spleen leads to internal haemorrhages.
- Large nodules have an irregular knobby contour over the organ's surface.
- Lesions are easily inoculated from the adjacent tissues.
- Nodules are firm but can be incised easily.
- Mineralization is rare.

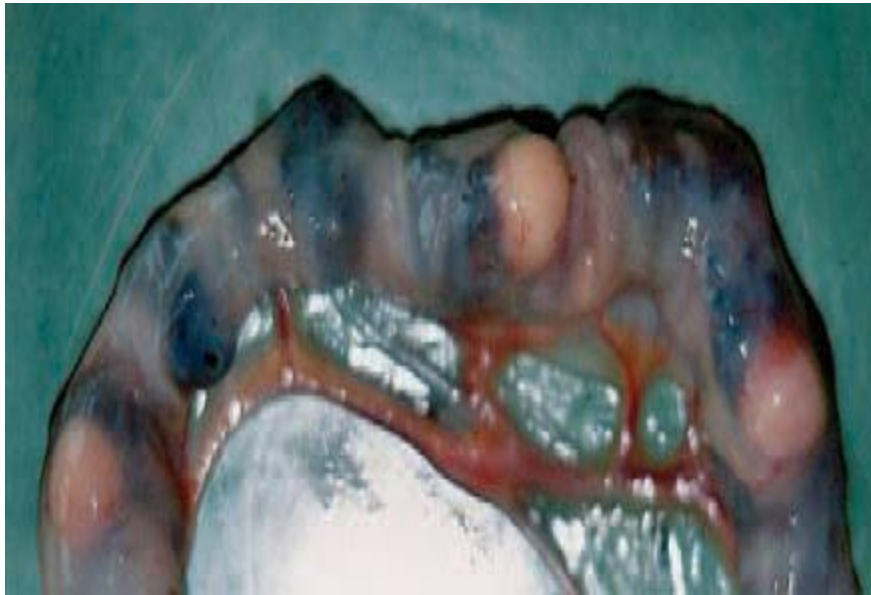
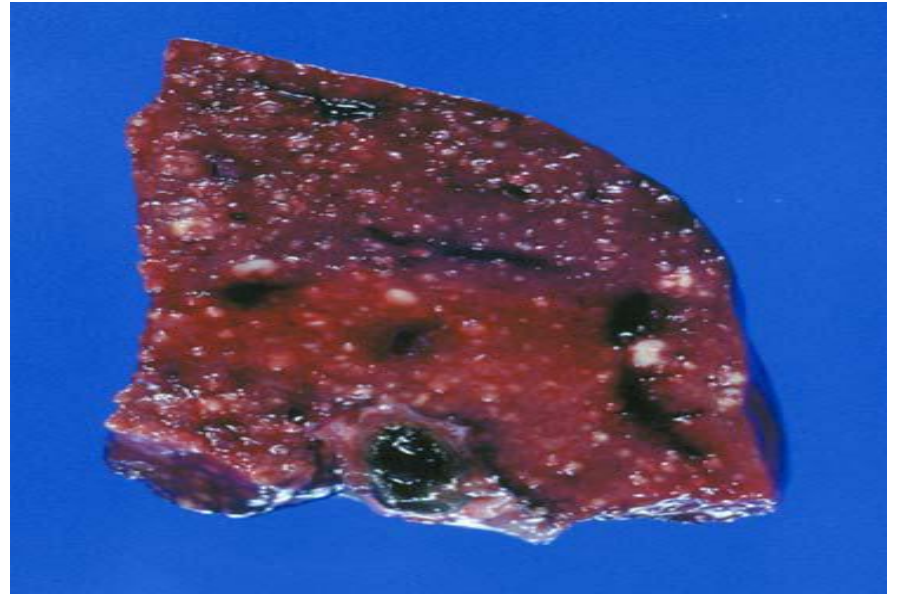
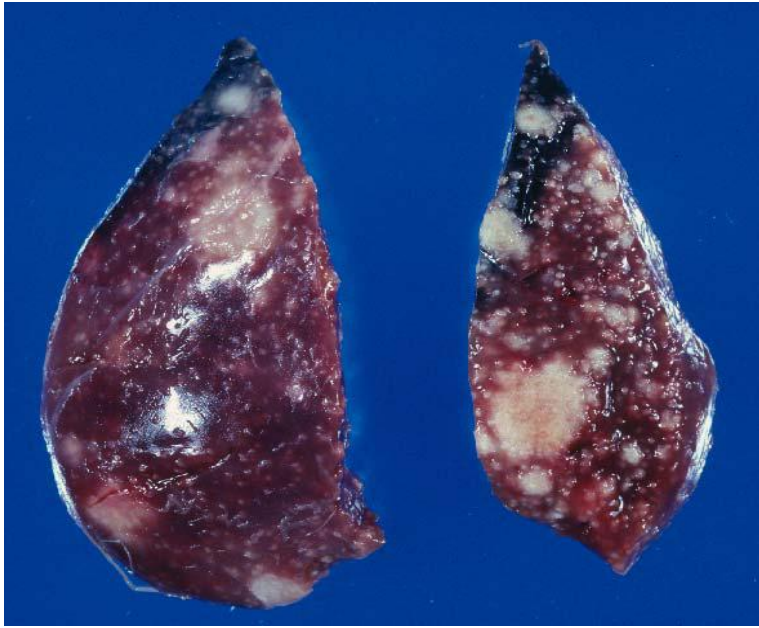
Lesions

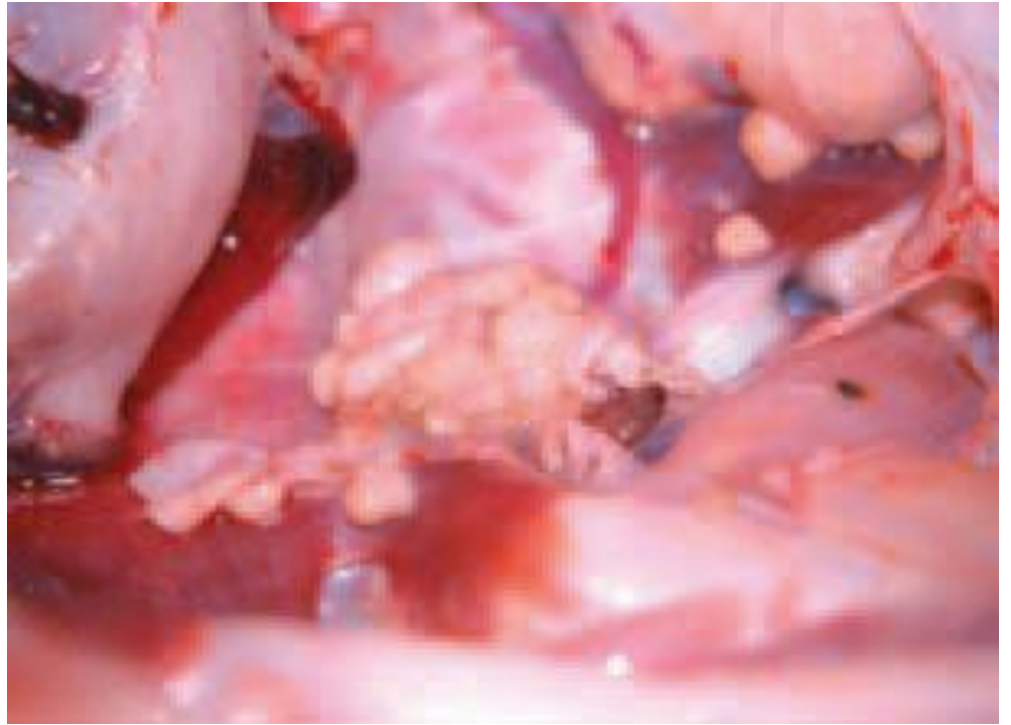
- On cross section, a nodule may contain a variable number of small yellowish foci or a single soft caseous center surrounded by fibrinous capsule.
- The capsule continuity may be interrupted by small circumscribed necrotic foci.
- Involvement of the lungs is usually less severe than that of liver and spleen.
- Granuloma formation is frequent in the bone marrow.













Goose - nodulated lesions of tuberculosis in the lung .



Goose - tuberculous lesions in the liver and lung



Diagnosis

- Samples are taken from the organs showing lesions (liver, spleen, bone marrow and kidneys).
- Specific or selective enriched media are:
 - ✓ Lowenstein-Jensen media with glycerol.
 - ✓ Dorset egg media.
 - ✓ Middlebrook 7 H 10 agar media.
 - ✓ Proskauer-back liquid media.
- Addition of 5% serum, 5% glycerol enhances the growth of the organism.

Diagnosis

- Malachite green is added to Lowenstein-Jensen media to inhibit the growth of the organism other than mycobacteria and provide a colour contrast that facilitate the recognition of the colonies especially when the colonies are small in size.
- Incubate at 37-41C for 14-21 days under aerobic conditions or under 5-10% CO₂ tension.

Diagnosis

- The colonies on Lowenstein-Jensen media or egg yolk media appeared as light buff to slightly yellow, smooth, rounded and glistening.
- On Middlebrook 7H10 agar media appeared as flat white and translucent.
- On Proskauer-back liquid media appeared as turbidity with sediment formation.

Diagnosis

- The tubercle bacillus is an obligate aerobic and grows at 30-41C, optimally at 35-37C.
- Primary isolation may be successful on a variety of media, only Lowenstein-Jensen media with glycerol or sodium pyrovate may be recommended, after several subcultures, the bacillus will grow in a simple salt solution with glycerol.
- Incubate at 37C, growth on Lowenstein-Jensen media is slow, so that colonies are not visible before 2-3 weeks, incubation of negative slopes is continued for 6-8 weeks before discarding.

Diagnosis

- The colonies appears rough, buff to yellowish in colour and tough when picked up.
- The growth in glycerol broth appeared as whitish , wrinkled pellicle and granular deposit.
Dispersed uniform growth can be obtained by sub-culturing 2 or 3 times in Dubos and Davis liquid media containing tween 80.
- Addition of pyrovate is important to enhance the growth of certain species of mycobacterium and inhibit the others.

Diagnosis

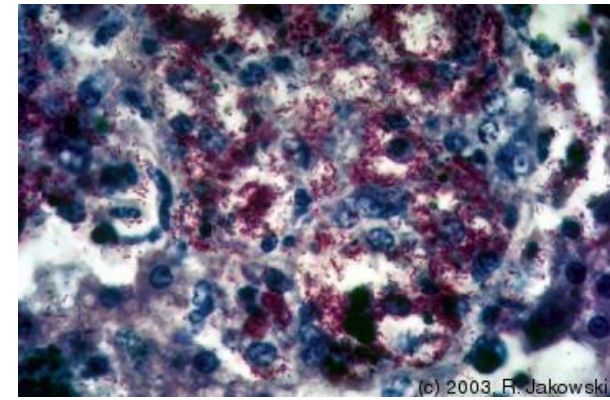
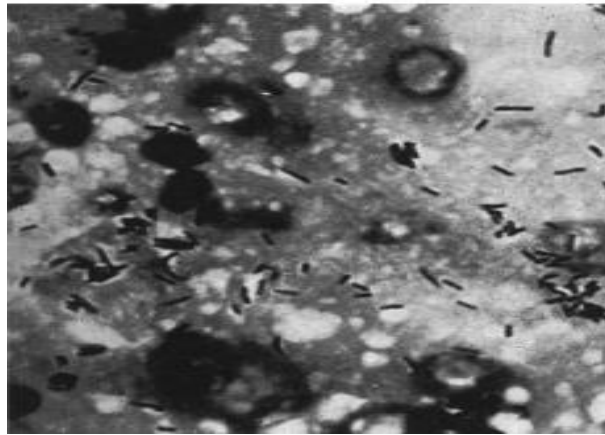
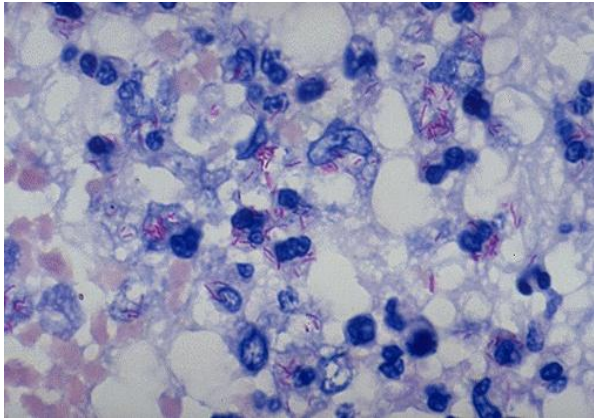
- Tubercle bacilli are acid fast bacilli and also alcohol fast after staining with Zeihl-Neelsen stain.
- Acid fast means resist de-colorization by acid (20% sulphuric acid in water), while alcohol fast means resist 3% HCl in alcohol.
- The bacilli are difficult to be stained due to the presence of waxy material in the cell wall.
- The bacilli stained red (acid fast) surrounded by non-acid fast bacilli which stained blue.
- The bacilli are highly pleomorphic, non motile, non sporulating and non capsulated.

Diagnosis

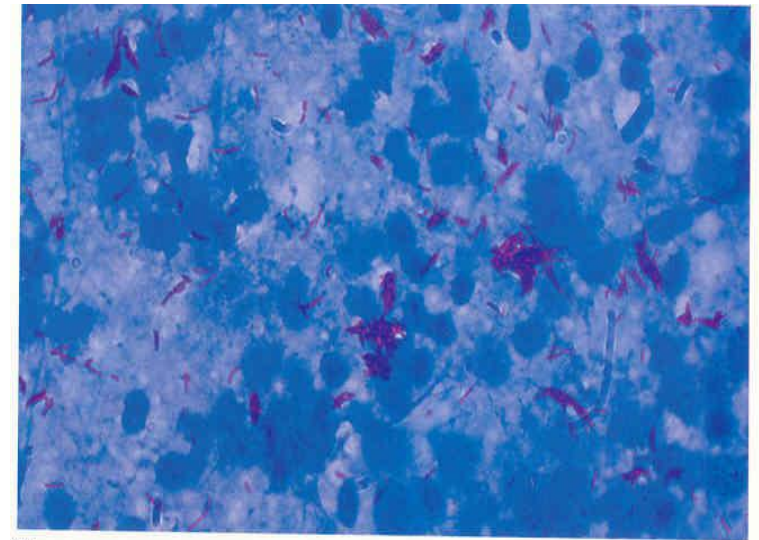
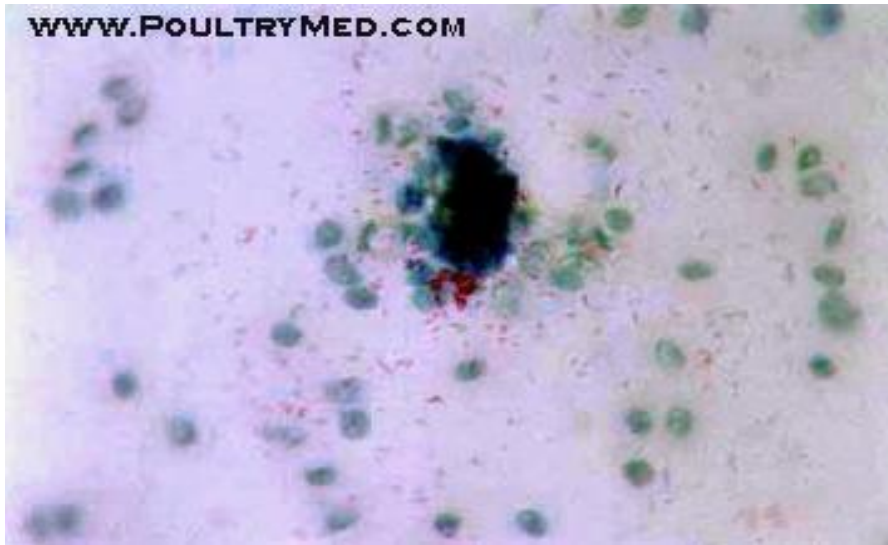
- The organism is positive catalase, reduces tellurite, don't produce acid in sugar containing media, don't reduce nitrate or produce niacin, negative peroxidase and don't hydrolyze tween 80.
- Serological tests like rapid whole blood agglutination test:
(one drop of 10% suspension of tuberculus bacilli in 0.85% Nacl containing 0.5% phenol) is shaken and added to one drop of the blood on slide:

Diagnosis

- Positive reaction appeared within 1 minute as granules, suspected results is obtained when agglutination occur within 1-2 minutes while negative reaction occur after 2 minutes.
- This test is less specific and less sensitive as false results could be obtained.
- ELISA test: considered as the most important and the best method for detection of antibodies (sensitive and specific).
- In recent years the phage typing of mycobacteria has progressed to the point where it is possible to identify several phage groups of *M.tuberculosis*, including type A, B and C.

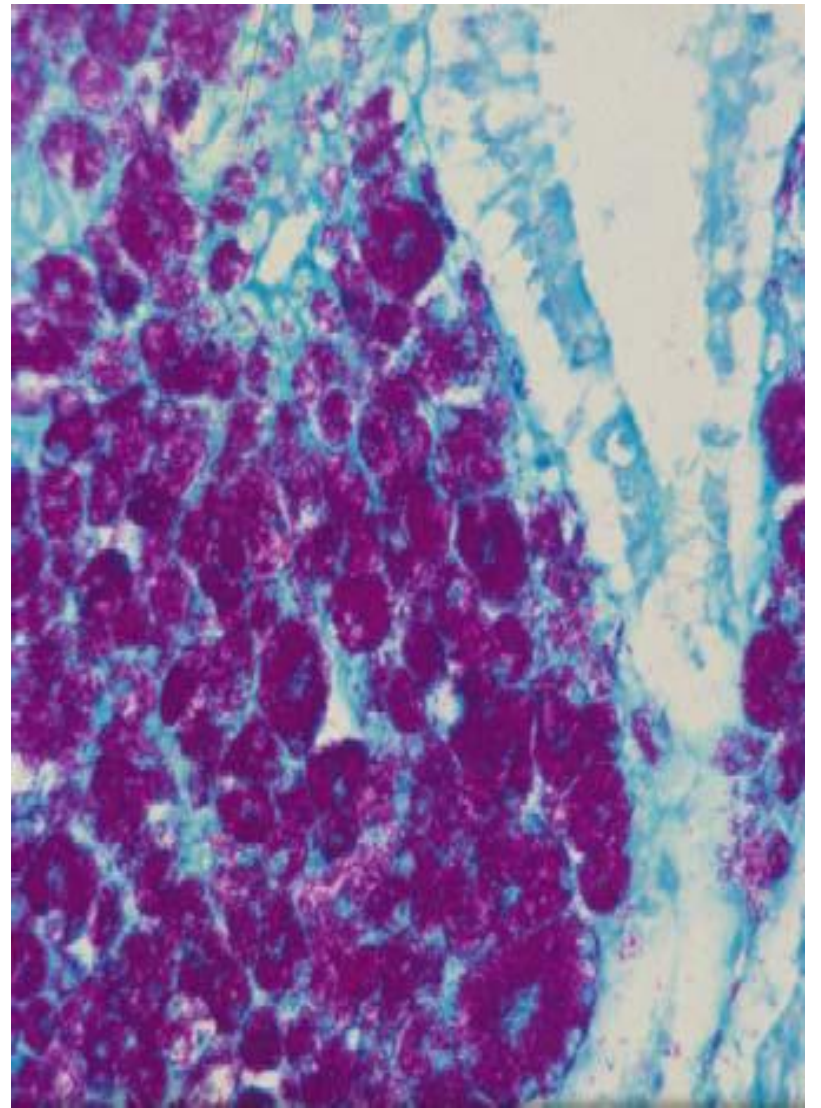
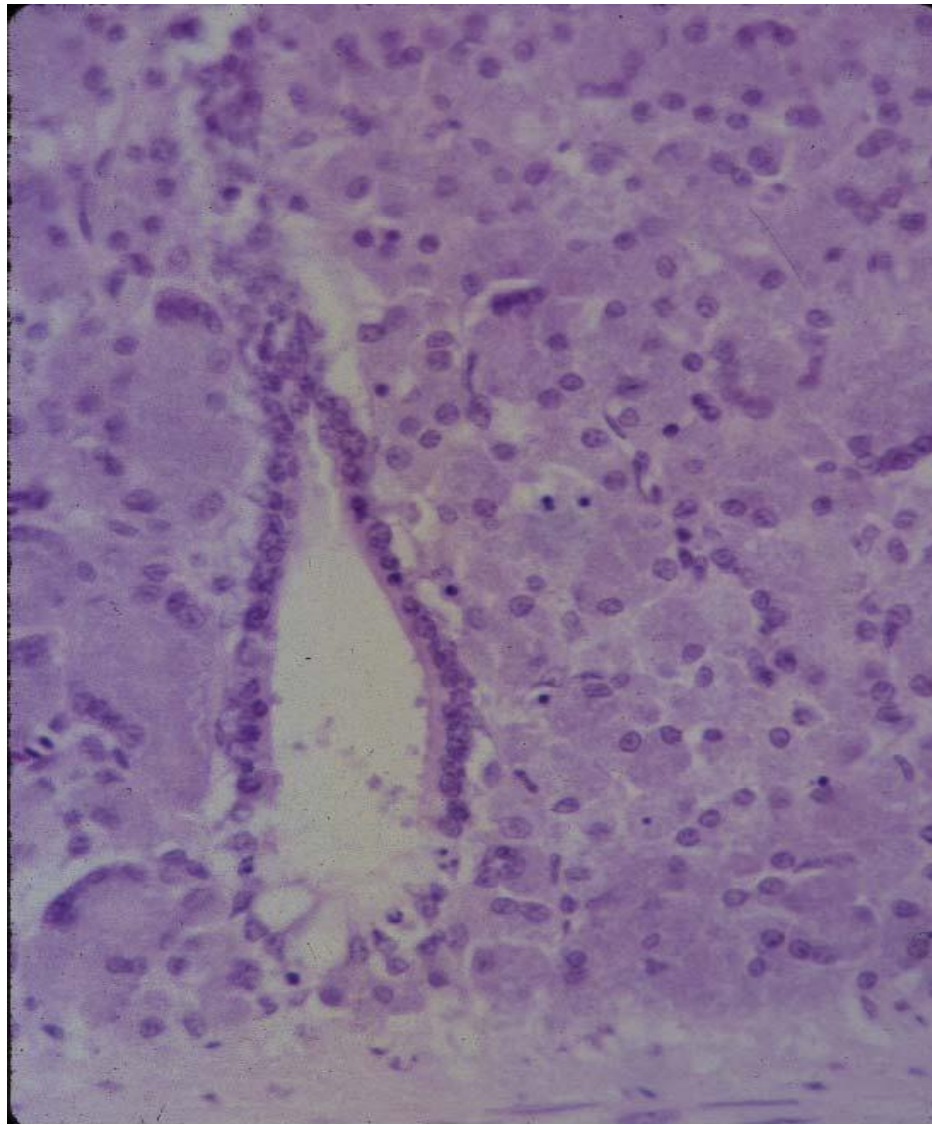


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Acid-alcohol-fast bacilli (AFB)



Tuberculin test

- The tuberculin test is an allergic field test and provides a satisfactory and rapid procedure for determining the presence of ATB in the flock.
- This test depends on delayed hypersensitivity reaction.
- The skin fold thickness of the wattles is measured with calipers. Intradermal injection of one wattles with 0.03-0.05 ml of purified proteins derivative tuberculin prepared from *M.avium* and the other was left as control.
- The positive reaction appears after 48 hrs as hot, painful, oedematous swelling of the injected wattle when compared with the control one.
- Positive birds must be discarded with hygienic disposal of them, while negative one should be kept in complete isolation in clean and disinfected houses.

Differential diagnosis

- Coligranulomas (Hjarr's disease).
- Pullorum disease.
- Other salmonella infections.
- Enterohepatitis.
- Fowl cholera.
- Neoplasia.

Prevention

- Tuberculin test should be made to detect infected cases and remove reacted birds.
- Use new environment free from ATB.
- Recommendation for control of ATB in exotic birds include the followings:
 - 1) Prevent the contact with TB infected birds, premises and housing previously used by them.
 - 2) Quarantine addition to the aviary for 60 days and retest with tuberculin test.

Control

- Treatment with antituberculosis drugs is impractical and is rarely done to treat domestic backyard poultry.
- However, combination of antituberculosis drugs as isoniazid (30 MG/KG), Ethambutol (30 MG/KG), and rifampicin (45 MG/KG) for months have been used to treat certain exotic birds maintained in captivity.

Thank you