

Mycoplasmosis

CLASSIFICATION OF AVIAN MYCOPLASMAS

- ** *M. gallisepticum*
- M. gallinarum*
- M. iners*
- M. anatis*
- * *M. synoviae*
- * *M. meleagridis*
- M. pullorum*
- M. gallinaceum*
- M. gallapavonis*
- * *M. iowae*
- M. columbinasale (pigeon)*
- Others

Characteristics of Mycoplasmas

- Smallest free living organisms
- Lack a cell wall
 - Non-hardy outside the host
 - Resistant to penicillin
- Complex nutritional requirements
- Parasitic life style

Cells attaching to tracheal epithelium



Mycoplasma colonies



Mycoplasma gallisepticum

- A respiratory disease primarily of chickens and turkeys, characterized by respiratory signs and lesions and a prolonged course in the flock.
- MG is one of the more costly diseases of commercial poultry.
- In chickens the disease was originally known as PPLO - pleuropneumonia-like organism.
- It is also called CRD or chronic respiratory disease in chickens and infectious sinusitis in turkeys where it is manifested predominantly by swelling of the infraorbital sinuses.
- Conjunctivitis in house finches has been present in the Eastern U.S. since the late 1990's

ETIOLOGY

- The problem is caused by *Mycoplasma gallisepticum*. The organism is coccoid and 0.25 - 0.5 microns in diameter. Mycoplasmas have no cell wall.
- MG alone only causes mild lesions in chickens. However, this organism is often associated with one or more of the following agents and pathogenicity is enhanced by association with infectious bronchitis, Newcastle disease, *E. coli*, dust, or ammonia.

INCUBATION PERIOD

- Four to 21 days for complicated disease. Longer (10-21 days) for uncomplicated disease.

COURSE OF THE DISEASE

- Weeks to months. Becomes chronic.

MORTALITY

- Negligible in adult birds.
- Broilers up to 30% in complicated cases.
- Often the mortality rate may be low but the cull rate is high due to severe respiratory disease.

METHOD OF SPREAD

- MG is transmitted in some of the eggs (transovarian transmission) laid by inapparent carriers.
- The shed rate of the bacterium is highest (about 30%) during the acute phase of infection but decreases (to about 5%) during the chronic phase of the disease.
- Chickens will remain infected after clinical signs have disappeared. Infected progeny then transmit the agent laterally, probably through infectious aerosol coughed into the air.

METHOD OF SPREAD

- MG seldom survives for more than a few days outside of the host.
- Although MG is not highly infectious like respiratory viruses, outbreaks in MG clean flocks have been traced back to humans as a mechanical vector.

COMMENT

- Infected eggs from infected breeders have been dipped in antibiotic solutions or super heated to destroy the bacteria prior to setting the eggs. This decreases hatchability as well as transmission.
- Infected eggs from infected breeders should be set separately from eggs from uninfected flocks to prevent lateral transmission of the organism in the hatchery.

CLINICAL SIGNS

1. Nasal discharge - usually 1st sign.
2. Conjunctivitis.
3. Respiratory rales.
4. Often starts at 10 days to 2 weeks after viral vaccination.
5. Loss of body weight.
6. Long standing respiratory signs.
7. Lower egg production in hens.
8. Swollen sinuses in turkeys.

Sinusitis



Sinusitis



Sinusitis



House finch conjunctivitis



Sinusitis



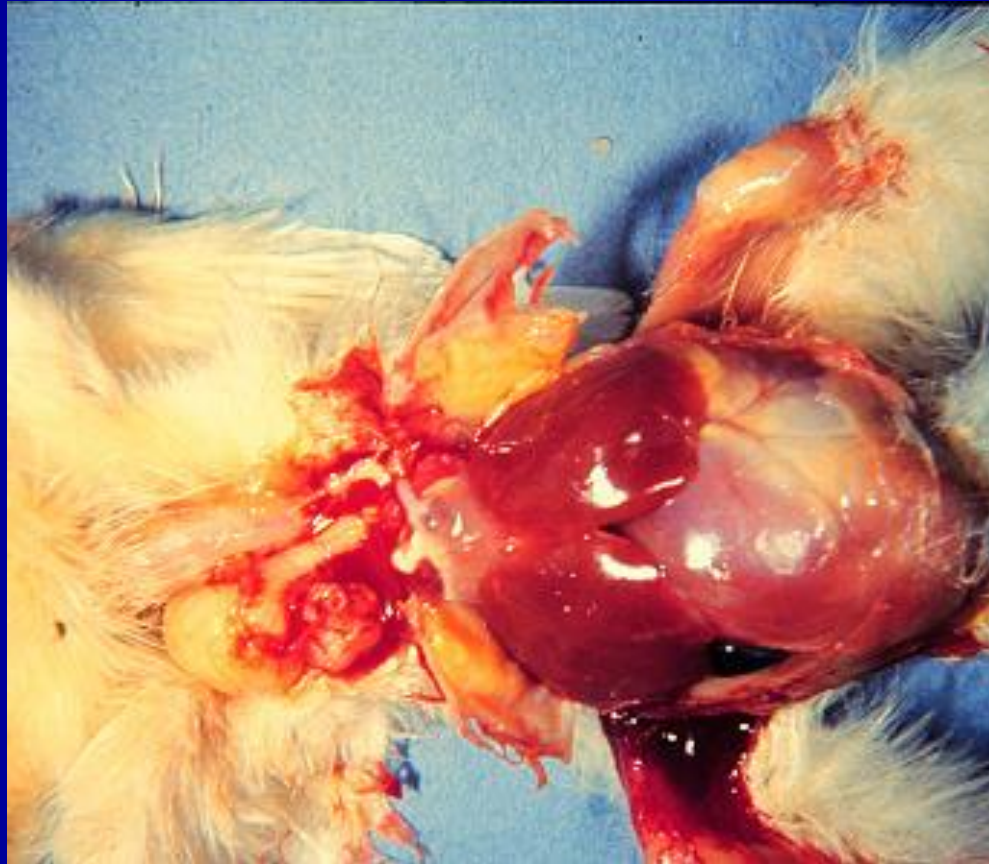
COMMENT

1. Problems in broilers can often be traced back to a single breeder flock.
2. Pullets are often raised MG free and become infected after being placed in laying houses on multiple-age farms.

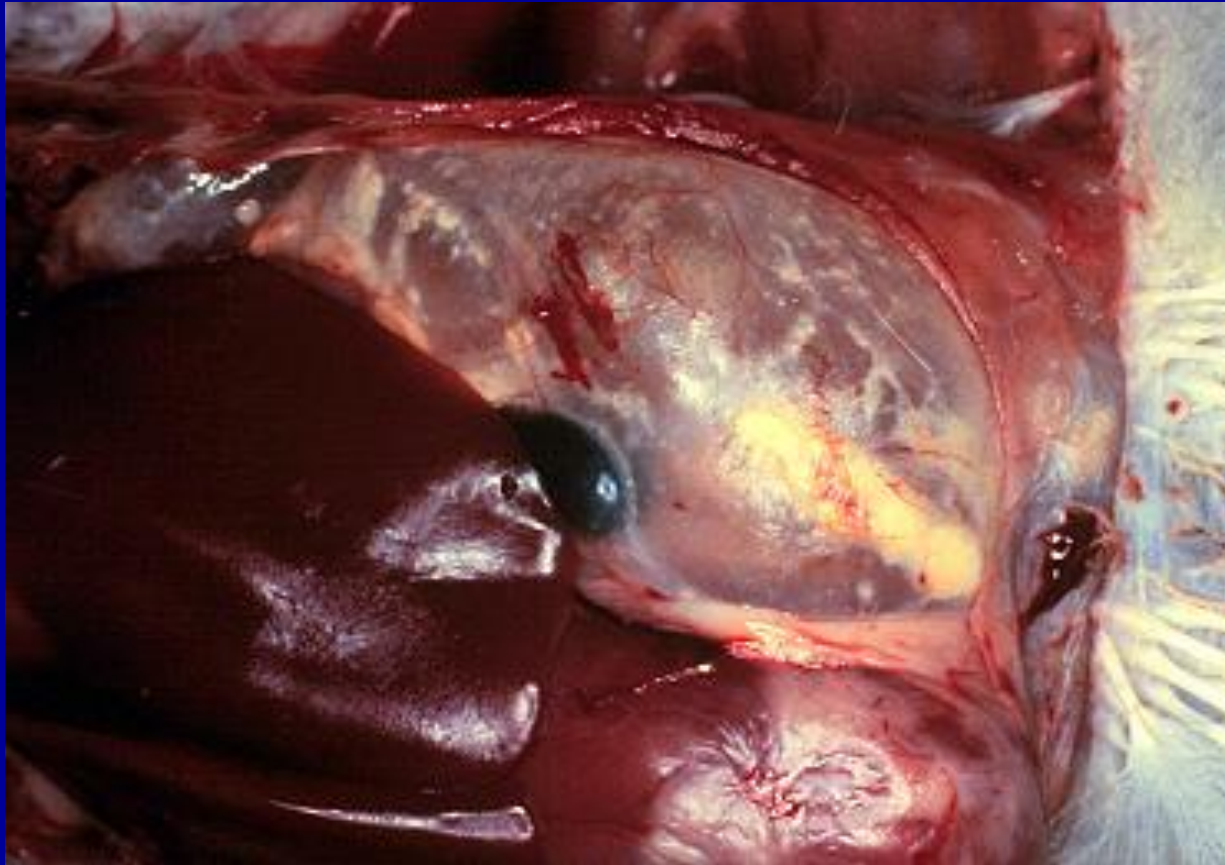
POSTMORTEM LESIONS

1. Mucoid or catarrhal exudate in nasal passages, trachea, bronchi, and thoracic air sacs.
2. Early cloudiness of the air sacs is caused by infiltration of mononuclear cells and hyperplasia of epithelial cells. Early in the infection air sac exudate has the appearance of "soap suds".

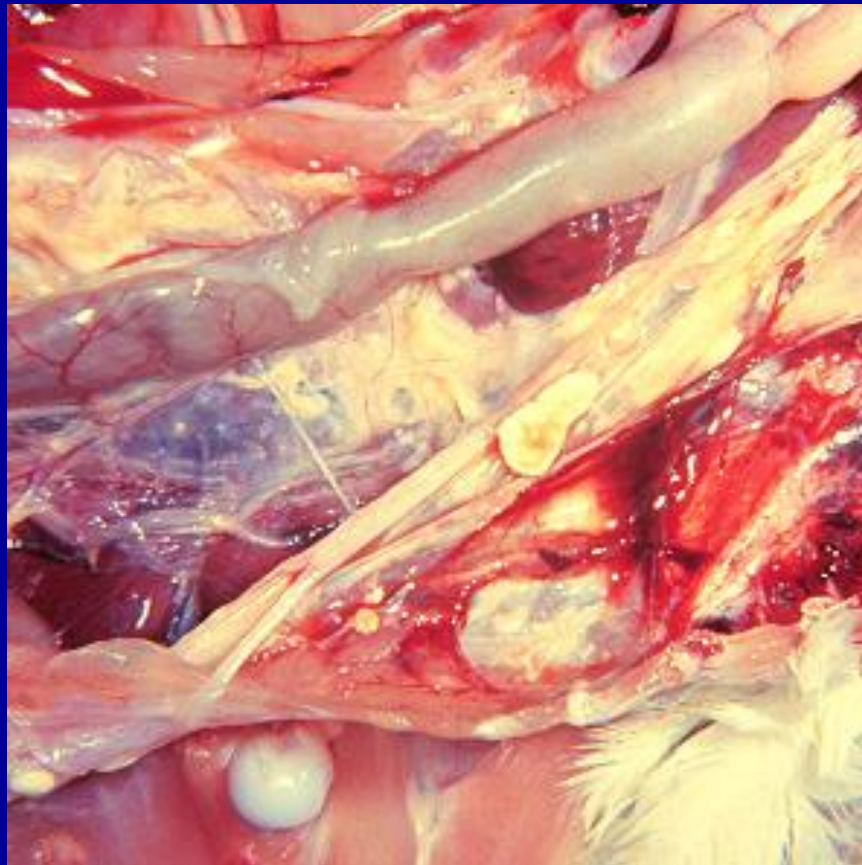
Airsacculitis



Airsacculitis



Airsacculitis



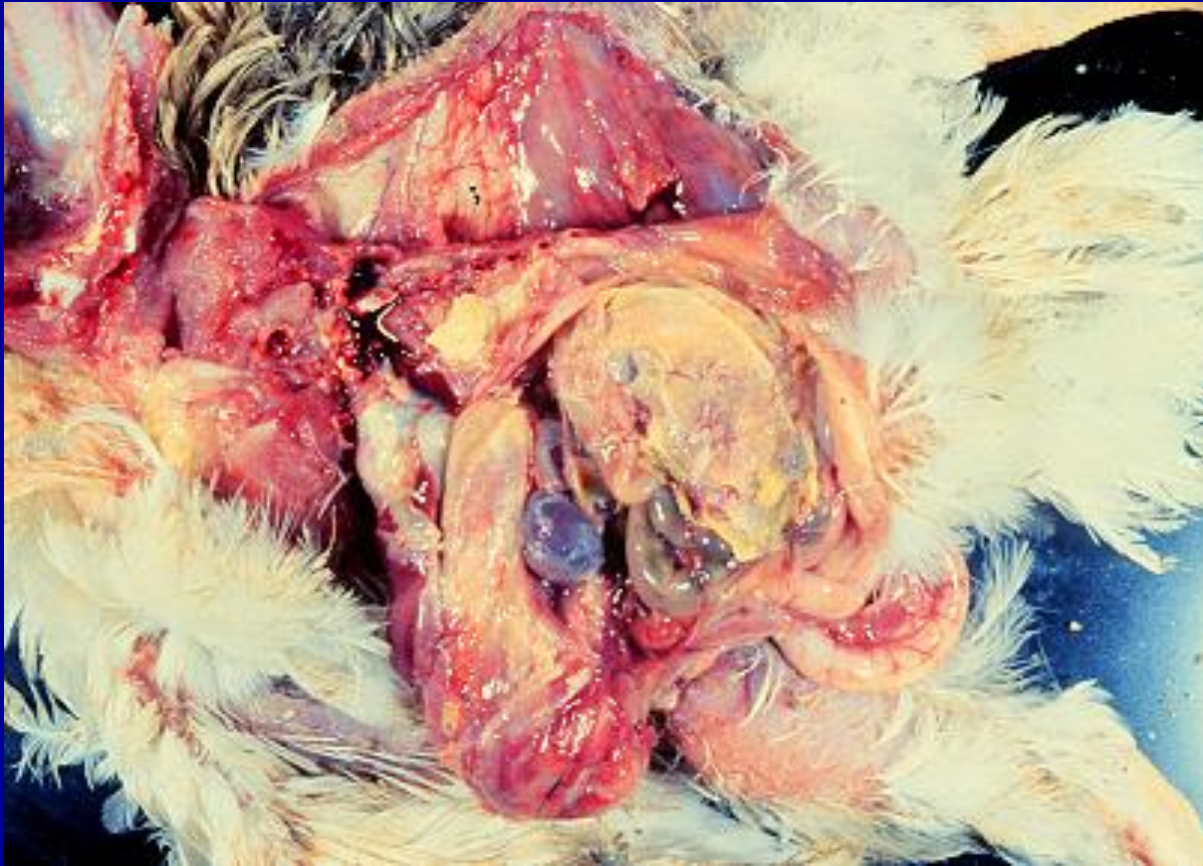
Airsacculitis, pericarditis



POSTMORTEM LESIONS

3. Later this material organizes and becomes caseous and yellow. Pericarditis and perihepatitis are often a sequelae of the disease when it becomes complicated with *E. coli*. High condemnations at processing will result.
4. In infectious sinusitis of turkeys, lesions may be restricted to swelling of the infraorbital sinuses. Conversely, sinusitis may be absent although rhinitis, tracheitis, and airsacculitis occur and there may be fibrinous pneumonia.

CRD



CRD



DIFFERENTIAL DIAGNOSIS

Turkeys

Newcastle disease

Avian influenza

E. coli

Ornithosis

Fowl cholera

Bordetella

Chickens

Newcastle disease

Infectious bronchitis

E. coli

Infectious coryza

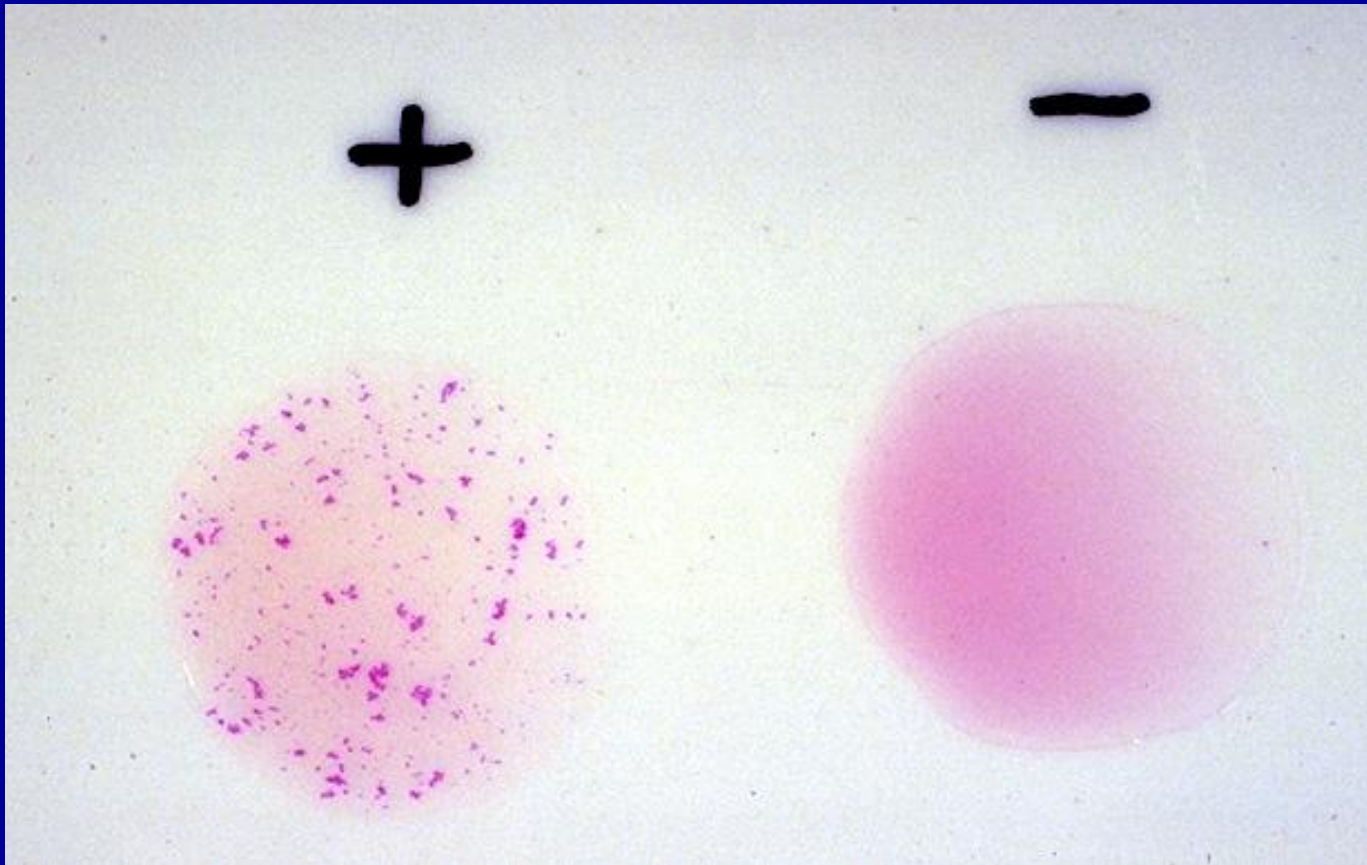
DIAGNOSIS

1. Suggestive - history of chronic respiratory disease accompanied by lowered feed consumption, poor gains, or lowered egg production with typical gross lesions. Positive plate agglutination reaction of suspect birds.
2. Confirmation - Hemagglutination inhibition (HI) test may be delayed more than two weeks after a positive plate reaction.

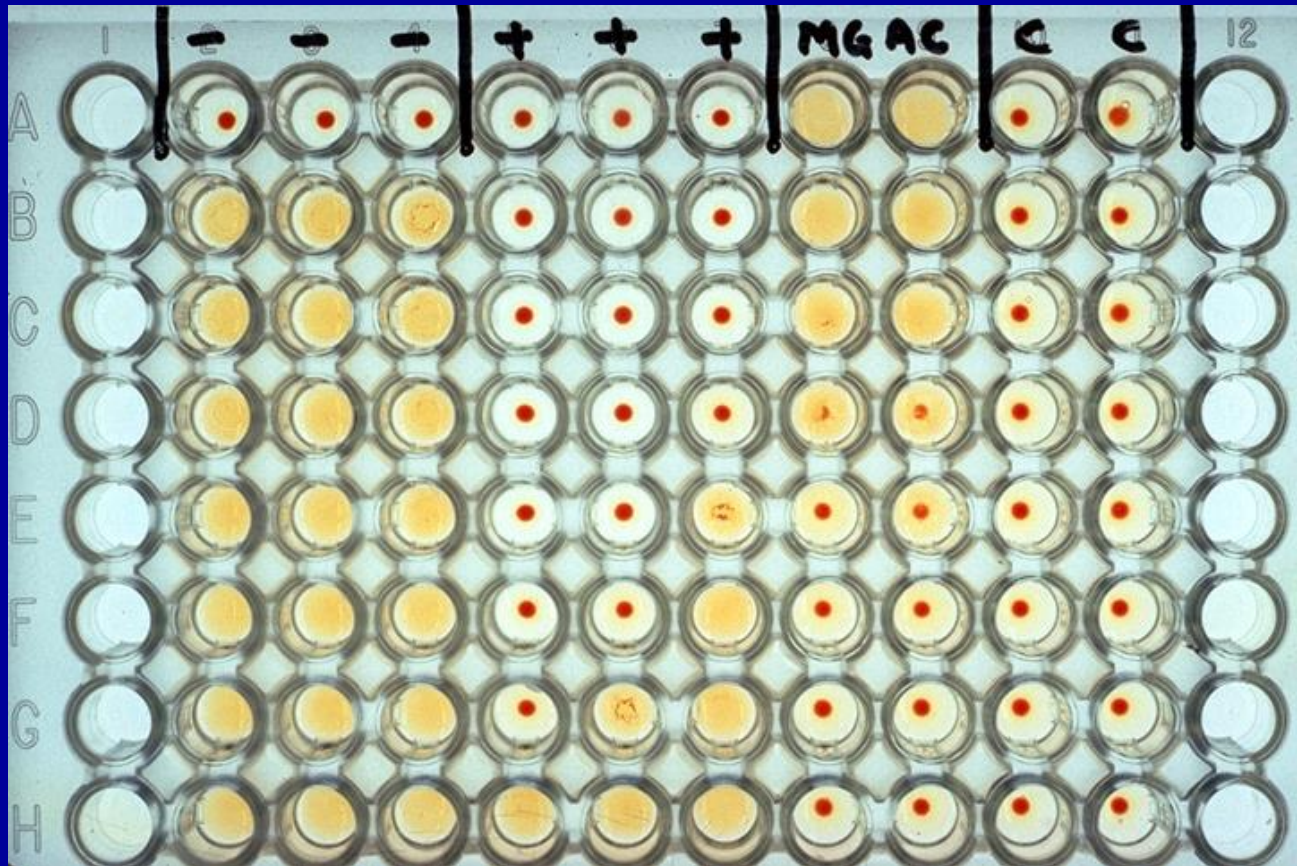
DIAGNOSIS (CONT.)

3. Isolation and identification of the agent is difficult and time consuming but is important if depopulation of an expensive flock is being considered.
4. A PCR procedure specific for MG is available.

Agglutination



Hemagglutination Inhibition (HI)



COMMENT

- False positive plate agglutination reactions to both MG and MS occur in chickens vaccinated with oil-emulsion vaccines or if the serum has been frozen.
- The vaccine reaction is transitory and will resolve in 4-6 weeks. In the case of false positive after the use of killed vaccines, retest the flock.
- The HI test will eliminate the false positive reactions.

TREATMENT

1. Marketing broilers with a low incidence of disease may be more economical than treatment because treatment can be very expensive.
2. Improving management is important in infected flocks. This involves improving air quality to reduce levels of dust and ammonia which can exacerbate the respiratory disease. Also, withholding respiratory vaccinations should be considered to avoid complicating the MG.

TREATMENT (CONT.)

3. Many broad spectrum antibiotics have been used and will suppress losses. However, relapses occur when treatment is discontinued. Most antibiotics are given in the feed or water, preferably in the water. The drugs of choice are tylosin or fluoroquinolones which are expensive. Tylosin is usually used in the drinking water at a rate of 2-3 g/gal. for 3-5 days. If given early the treatment works well.

TREATMENT (CONT.)

- When breeders are shedding, progeny are often inoculated at 1 day of age with 5 mg of spectinomycin alone or in combination with lincomycin or naxel.
- Tetracyclines have been used at 200-400 g/ton of feed. In order to best utilize this drug the calcium should be removed from the feed. This can be done for 5-7 days in broilers but not for more than 3 days in layers. It is less expensive than tylosin or the fluoroquinolones.

PREVENTION

1. Depopulation of infected premises and thorough cleaning and disinfection should precede the introduction of a "clean" flock.
2. Test foundation breeders and eliminate reactors.

PREVENTION (CONT.)

3. Quarantine measures must be strictly enforced and good management and sanitation must be practiced to keep a flock free of infection.
4. Bacterins and F strain live MG are being used on multiple-age commercial layer farms with great success. These are being used in pullets where it eventually replaces pathogenic MG. This can increase egg production by 7 eggs/hen. F strain is pathogenic in turkeys.

COMMENT

Program for Eradication of MG (used 20 years ago)

1. Test foundation breeder stock and remove MG reactors.
2. Dipping eggs in antibiotics, erythromycin or tylosin. This is done by placing hot eggs in cold solution.
3. Inject breeder progeny with tylosin in oil 4 times at 5 day intervals.
 - ▶ If no reactors after 2 generations, considered MG clean.

***Mycoplasma synoviae* (MS)**

- A mild respiratory disease which also results in inflammation of the synovial sheaths.
- This disease is known as infectious synovitis and occurs in both chickens and turkeys. It is primarily seen in young birds from 4 to 12 weeks of age.
- It is less virulent but spreads faster than MG. It is common in commercial laying flocks.

ETIOLOGY

Mycoplasma synoviae

- This is a fastidious organism which requires nicotinamide adenine dinucleotide for growth.
- There appears to be only one serotype although isolates vary in pathogenicity.

INCUBATION PERIOD

8 to 10 days.

COURSE OF THE DISEASE

Several weeks. Becomes chronic.

MORTALITY

- 1-10%. Morbidity can reach 75%.
- The severity depends on the virulence of the infecting strain.

METHOD OF SPREAD

- Vertical (egg) transmission and lateral (direct contact) transmission.

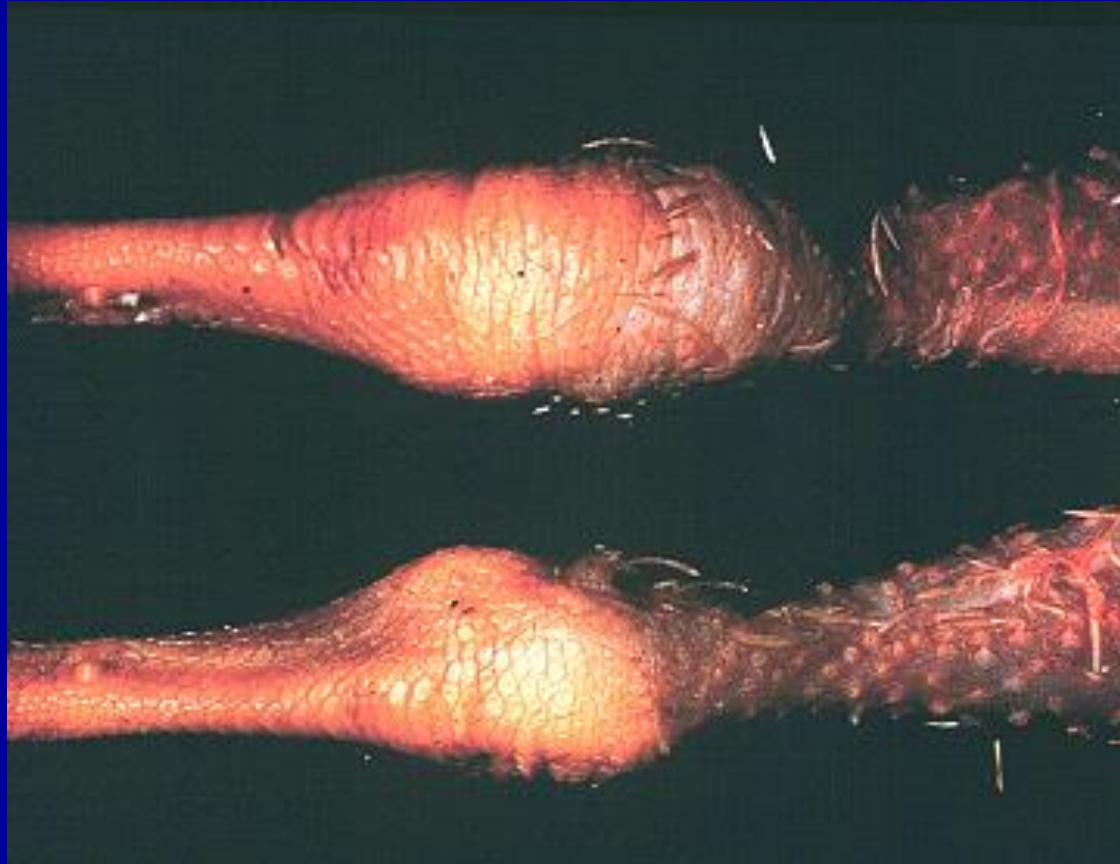
CLINICAL SIGNS

1. Lameness in pale combed birds showing retarded growth. Hock joints and foot pads become swollen and breast blisters appear. Affected birds are reluctant to move. When made to move they will run and sit down as soon as possible.
2. The feces of affected birds are often green and wet. Eventually many birds become dehydrated and thin.

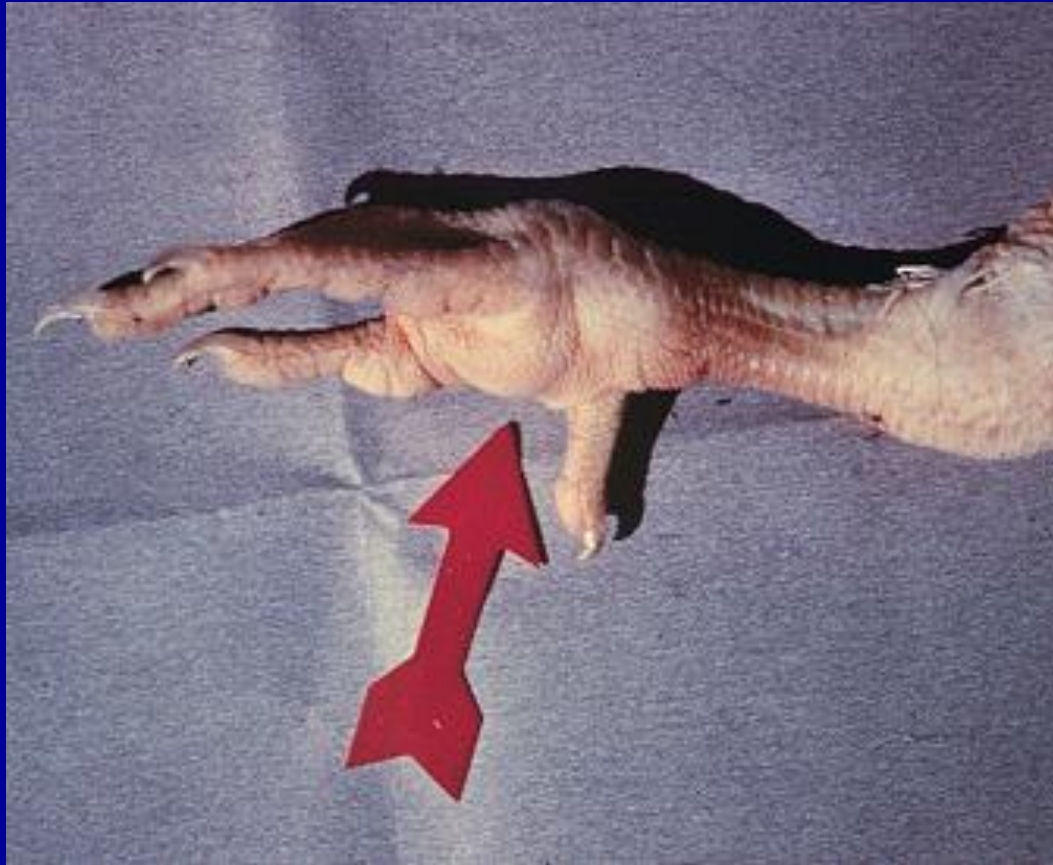
CLINICAL SIGNS (CONT.)

3. The respiratory form of this condition is very similar to the signs seen with MG but not as severe. They usually occur as a continuation of a viral vaccine reaction or are started by some other stress condition.
4. There may be no clinical signs with an MS outbreak, only positive plate agglutination reactions with positive HI reactions.

Swollen hocks



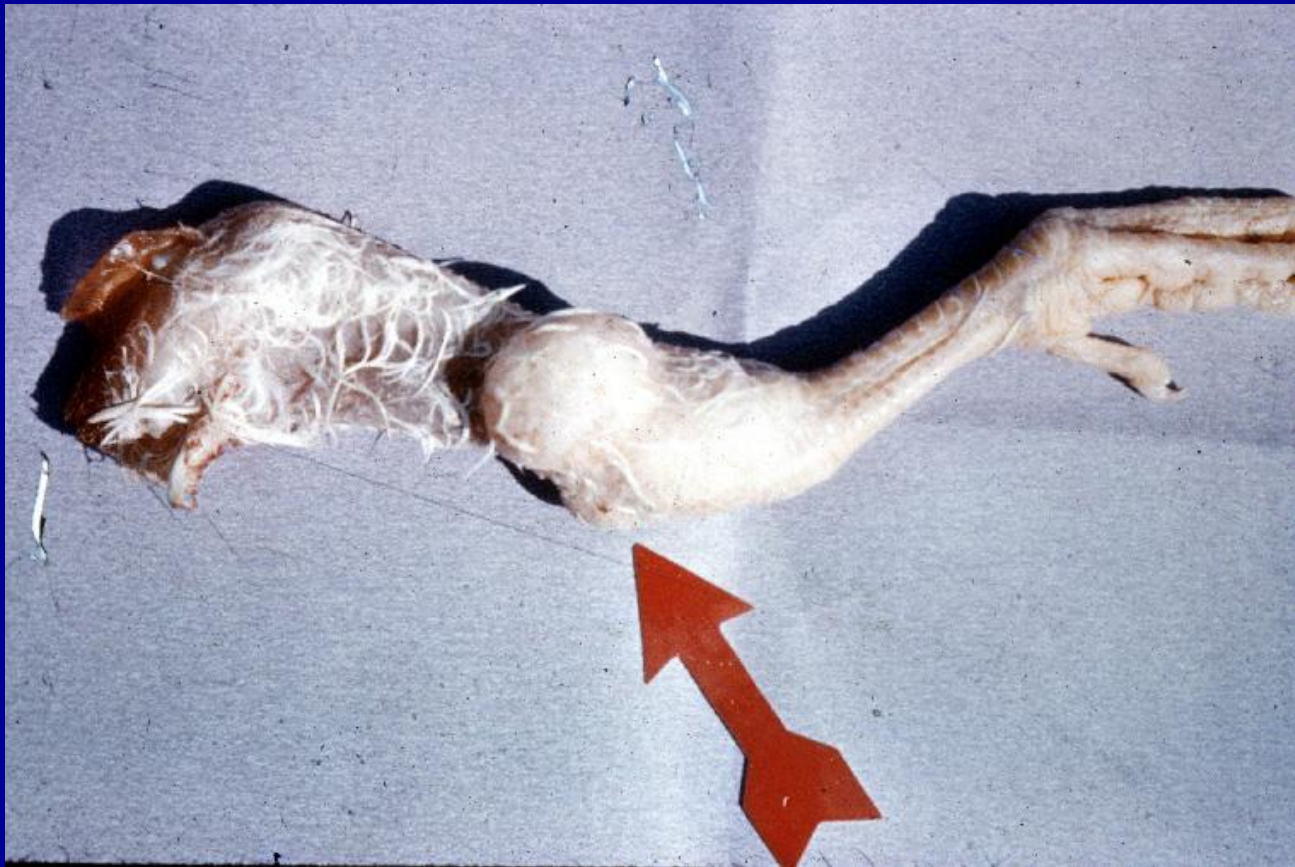
Swollen foot pad



Swollen hock and foot pad



Synovitis



POSTMORTEM LESIONS

1. In the early stages a viscous, creamy to gray exudate is seen in the hock and/or stifle joint, over the keel bone, and in the foot pads. As the disease progresses in individual birds, this exudate becomes caseous and may be yellow or orange with time.
2. The viscous creamy exudate is frequently seen in the wing joints and is one cause of condemnations in processing.

POSTMORTEM LESIONS (CONT.)

3. The liver, spleen, and kidneys are frequently enlarged. The enlarged livers are usually mottled and greenish to dark red in color.
4. Erosions on the articular surface may occur.
5. Respiratory lesions may be absent or consist of a mild mucoid tracheitis, airsacculitis, or sinusitis.

Synovitis



Keel bursitis



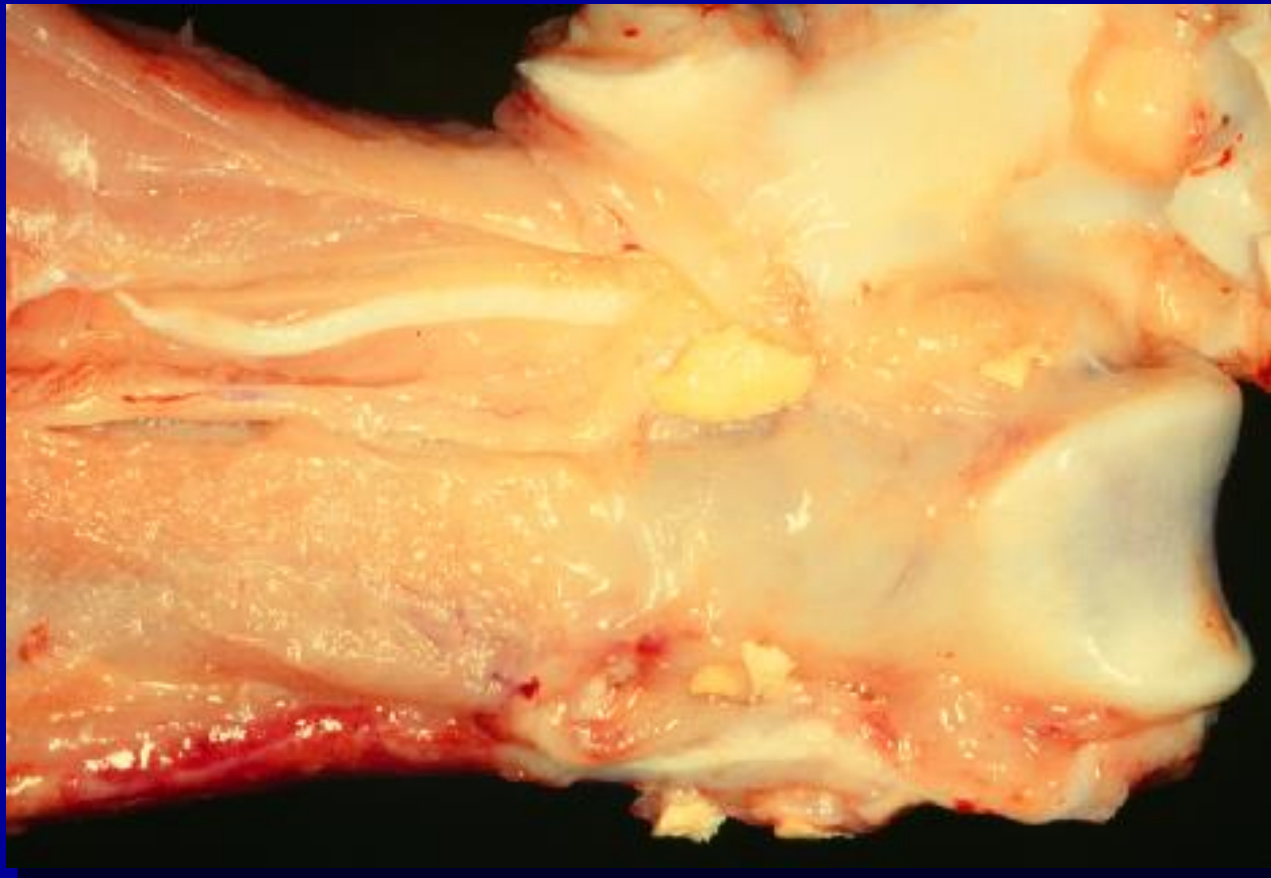
Synovial exudate



Cartilage erosions



Chronic synovitis



Airsacculitis



DIFFERENTIAL DIAGNOSIS

- Staphylococci
- Fowl typhoid
- Viral arthritis

DIAGNOSIS

1. Suggestive - Typical signs and gross lesions with a positive plate agglutination test on sera from a few birds in the flock.
2. Confirmation - Positive HI test. This reaction may be delayed a few weeks after the positive plate reaction.
 - ▶ Isolation and identification of the organism can be done in 5 days in a well equipped laboratory. The isolated Mycoplasma can be identified by direct immunofluorescent antibody techniques.

COMMENT

- Serology is less reliable than with MG.
- There are more problems with cross reactions.

TREATMENT

- Treatment of lame birds with well established synovitis is usually not very satisfactory.
- Potentiated tetracyclines at 200-400 g/ton with the calcium removed from the diet for synovitis.
- Tylosin in the water at 2-3 g/gal. at the time of vaccine reaction.
- Day-old injection of infected progeny with spectinomycin or gentamicin. Infected eggs should be hatched in a separate incubator.

PREVENTION

1. In breeders, test and segregate as with MG.
2. Start with chicks or poults that were hatched from MS clean flocks and raise the birds in quarantine, under all-in all-out conditions.

PREVENTION (CONT.)

3. Synovitis can usually be prevented by continuous administration of 75-100 g/ton chlortetracycline. This is expensive and rarely done.
4. An oil-emulsion bacterin is commercially available and is of some benefit where the risk of infection is high. The product is expensive and requires handling of each bird because the vaccine must be injected.

***Mycoplasma meleagridis* (MM)**

- A disease of turkeys characterized by an inapparent venereal infection in breeder turkeys and airsacculitis in embryos or recently hatched poults.
- Most large turkey breeder flocks are free of MM infection due to testing and eradication efforts.

ETIOLOGY

Mycoplasma meleagridis

COURSE OF THE DISEASE

- Air sac lesions usually resolve by 12 weeks.
- Some birds may develop bone deformities in which case crooked necks may persist.

MORTALITY

- Very low. Culling is the more serious problem.

TRANSMISSION

- The disease is spread venereally from tom to hen.
- Egg transmission leads to infection of the embryo.
- Lateral spread within a flock via the respiratory route.

CLINICAL SIGNS

- Most of the signs are mild or inapparent on casual examination and go unobserved.
- Often there is impaired hatchability of eggs from infected flocks. Embryo mortality is highest after eggs are transferred to the hatcher.
- Reduced growth and feed efficiency.

CLINICAL SIGNS (CONT.)

- Stunted birds with skeletal deformities especially of the neck and legs. This lesion is rare.
- Respiratory infection is present in young poultts but usually regresses by 7-9 weeks of age unless predisposed by other primary pathogen or secondary *E. coli*.

Cull birds



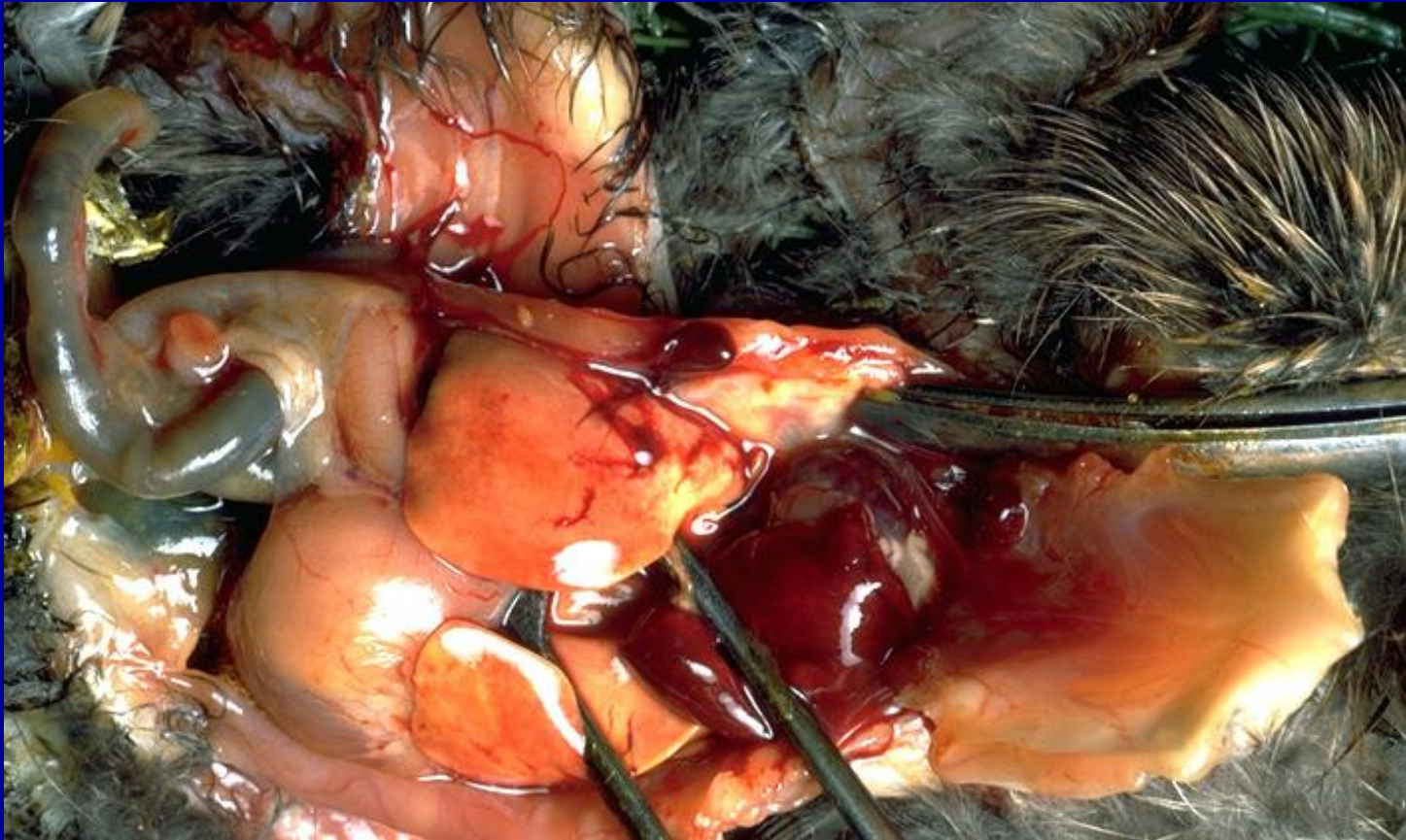
Cull bird with crooked neck



POSTMORTEM LESIONS

1. Air sac lesions in 1-day-old poults. The incidence will peak at 4-6 weeks of age. It will be inapparent in older birds.
2. Poults with wryneck may have osteomyelitis of adjacent vertebra.

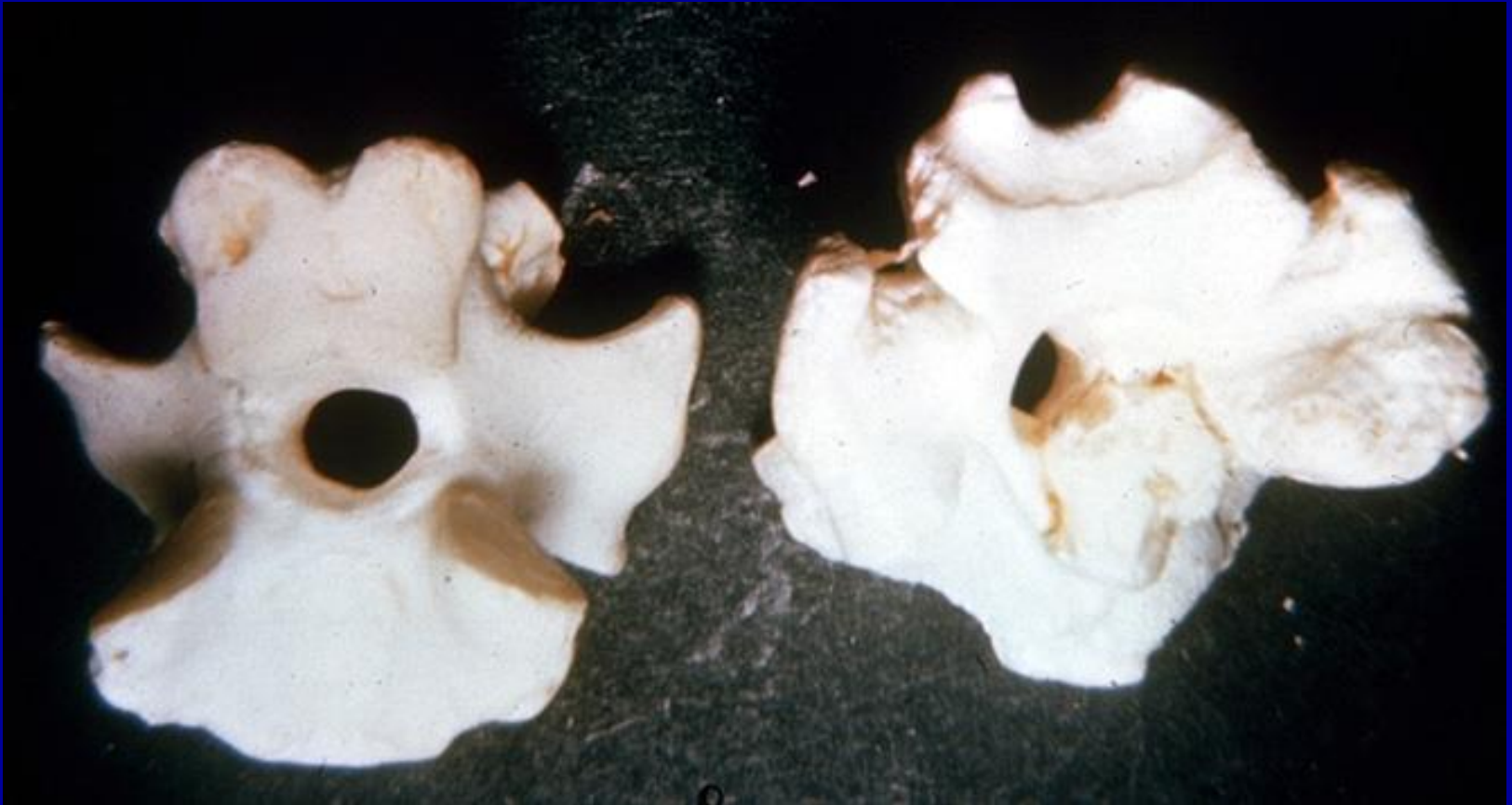
Day-old air sac lesion



Crooked neck



Arthritic Vertebrae



DIAGNOSIS

1. Suggestive - Air sac lesions in 1-day-old poult. Positive plate agglutination test.
2. Confirmation - Positive HI test or isolation of the organism.

TREATMENT

- No practical treatment in affected flocks. Use of lincomycin/spectinomycin in the drinking water at 2 g/gal. for the first 5-10 days of life may reduce the airsacculitis and improve weight gains.
- However, the clinical signs are transient and antibiotics will not clear the infection.
- Antibiotic use will also have no effect on reducing egg transmission.

PREVENTION

1. Egg dipping in 3000 ppm of tylosin reduces but does not eliminate infection. Eggs are heated and placed in a cold water bath or antibiotic solution under a vacuum. Eggs can also be injected with 0.6 mg gentamicin sulfate and 2.4 mg of tylosin in a 0.2 ml volume.
2. Begin with MM free poultts obtained from clean breeder flocks.
3. Serologic testing and culturing has not been satisfactory.

The Mycoplasmoses

Name of the disease	Etiologic agent	Type of bird affected	Nature of the disease	Major lesions
Chronic Respiratory Disease	<i>Mycoplasma gallisepticum</i>	Chicken	A respiratory disease	Airsacculitis, adhesive pericarditis, fibrinous perihepatitis. Occasionally causes synovitis or salpingitis
Infectious sinusitis	<i>Mycoplasma gallisepticum</i>	Turkey	Unilateral or bilateral sinusitis. May spread to or occur initially in the lower respiratory system	Swollen infraorbital sinus(es) may or may not be followed by airsacculitis
Infectious synovitis	<i>Mycoplasma synoviae</i>	Chicken & turkey	Involves synovial lining of joints, tendon sheaths. Results in lameness, debility	Swollen joints and tendon sheaths. Feet, shanks, hocks more obviously affected. Occasionally causes airsacculitis in broilers & turkeys
<i>Mycoplasma meleagridis</i> (MM) infection	<i>Mycoplasma meleagridis</i>	Turkey	Venereal infection of turkeys, usually transmitted by infected, pooled semen. Produces airsacculitis in many progeny	Airsacculitis in nonhatching or newly hatched poults. May spread laterally to other young poults as an airsacculitis. May lead to airsacculitis in market birds

