

PSEUDOMONIASIS

› **DEFINITION:**

- › It's localized or systemic disease in young and growing poultry which invades fertile eggs causing death of embryos and newly hatched birds, and reduces shelf life of contaminated meat.
- › This organism causes disease in poultry as an opportunist pathogen.

› **EPIDEMIOLOGY:**

› **1. Cause:**

- › The genus *Pseudomonas* consists of many species but *Pseudomonas aeruginosa* is the one mainly involved in poultry disease. However, *P. fluorescens* can cause death of turkey embryos.
- › The organism is a Gram-negative, motile, non-spore forming, straight or slightly curved rod. It is a strict aerobe and will grow at 42 C but not at 4 C.
- › Fluorescence can be demonstrated when the organism is grown in special media.
- › The organism is ubiquitous in nature, being found in soil, water, sewage, lakes, on the surface of plants and in the intestinal contents of animals and birds.
- › It is relatively resistant outside the body of the host, being able to survive on a very limited food supply.
- › In general it is resistant to a number of antimicrobials but in this there is strain variation.

› **2. Distribution:**

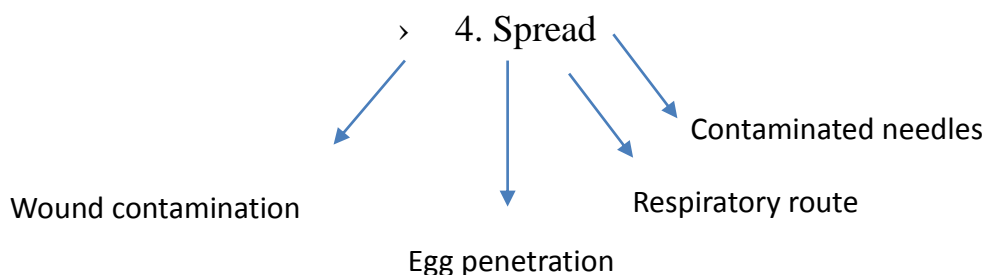
- › The infection is worldwide.

› **3. Susceptibility:**

› **3. a. Host**

- › Disease associated with pseudomonads has been recorded in a range of animals and plants.

- › Among poultry occurs in chickens, turkeys, ducks, geese, pheasants, ostriches and variety of captive bird.
- › Severely stressed or immune-deficient birds.
- › **3. b. Age:**
- › All ages of poultry are susceptible but young birds are more susceptible than older stock.
- › **N.B. Concurrent infections with viruses and other bacteria, especially mycoplasmas, are common and may affect susceptibility to Pseudomonas.**
- › **4. Spread**
- › They are ubiquitous, often associated with soil, water, and humid environments.
- › *P. aeruginosa* is an opportunistic pathogen and infection may occur through:
 - › Skin wounds.
 - › Contaminated vaccines and antibiotic solutions.
 - › Contaminated hatchery.
 - › Egg dipping or egg inoculation.
 - › Contamination of needles used for injection.
- › Infection can also spread from infected to susceptible flocks on the same premises under conditions of inadequate hygiene.
- › Contact with infected birds and intense, continuous broiler production with different ages being raised at the same facility can result in spread of Pseudomonas infection



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5. Morbidity and mortality

Morbidity and mortality varies from 2%-10% but can be much higher, approaching 100%.

> Greatest losses occur in very young birds.

6. Influencing factors

> The adverse effect of the organism can be increased by concurrent infection with other pathogens and by stress and immunodeficiency of the host.

7. Incubation period:

> The period of incubation is very short – from a few hours to 2 days and the duration of systemic disease is also of short duration.

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DIAGNOSIS:

1. Field diagnosis:

A. signs:

Clinical signs are influenced by which organs and tissues are affected and may vary greatly.

They can include one or more of the following:

- depression
- Incoordination.
- Ataxia.
- Torticollis.
- Lameness.
- Swelling of the head, wattles, sinuses and joints especially of the leg.
- Diarrhea.
- Conjunctivitis, keratitis, panophthalmitis and respiratory signs.
- Omphalitis.
- Death usually occurs rapidly; often within 24-48 hours.

B. lesions:

Lesions reflect the clinical disease and include:

- pericarditis, perihepatitis and air sacculitis.
- In some cases they may be similar to those seen in colisepticaemia.
- subcutaneous edema, especially of the head and neck.
- exudate in affected joints.
- necrotic focal lesions in the liver, spleen, kidney and brain.
- yolk sac infections and septicemia in young chicks.
- Sinusitis and Pneumonia.
- Unilateral panophthalmitis or cellulitis especially in turkey.
- Pseudodiphtheretic membranes and pyogranulomatous in the respiratory and upper digestive tract occurred in a group of young ostriches experiencing high mortality.
- Pseudomonas was isolated infrequently from adult hens with salpingitis and oophoritis, and from geese with venereal disease.



P. aeruginosa infection via a contaminated injectable Marek's vaccine. About 24h after the vaccination, nervous signs are appearing: incoordination, ataxia, unilateral lameness (if the vaccination is manual). Automatically vaccinated chickens exhibit subcutaneous oedemas in the region of the neck, sometimes involving the head.

Subcutaneously, serous or haemorrhagic oedemas are detected.



A subcutaneous haemorrhagic oedema in the region of the neck about the site of MD vaccine application.



local forms of *P. aeruginosa* infection are conjunctivites and consequent keratitis and panophthalmrtes



Arthritis and periarthrites are encountered in broilers as well as in growing birds. Tibiotarsal joints are most commonly affected. The skin and the mucous coats are the entrance door of the infection.



Acute septicaemic *P. aeruginosa* infection. Serofibrinous inflammation of serous membranes in the pleuroperitoneal cavity (aerosacculitis, pericarditis, and perihepatitis) is detected. The lesions strongly resemble (imitate) these observed in *E. coli* septicaemia



Sometimes, subcutaneous haemorrhages in the muscles are present



Local *P. aeruginosa* infections. They are encountered secondary to septicaemia or independently. Pododermatitis and inflamed footpad are usually observed in broilers at the age of 7 -14 days.

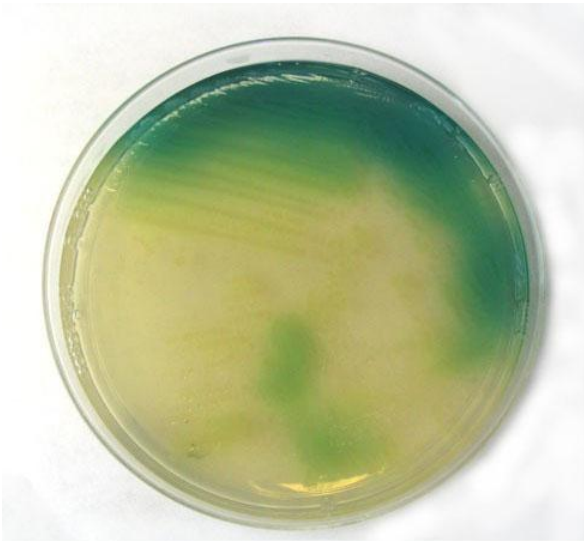
2. Laboratory diagnosis:

› Diagnosis can be confirmed by:

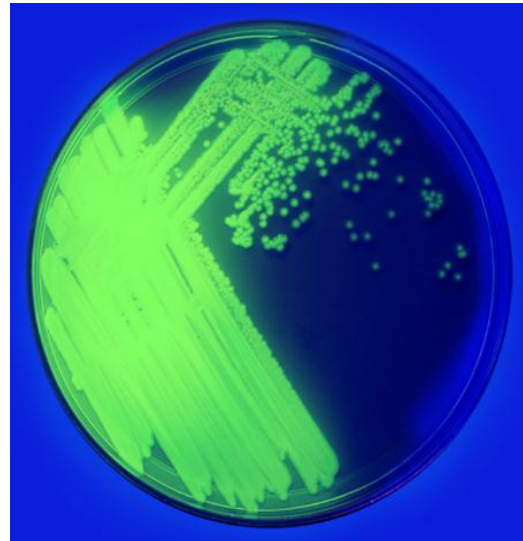
- ❖ Sampling: from lesions
- ❖ Isolation of the organism: it can be grown readily on common bacteriological media as nutrient agar or on specific media as pseudomonas F agar media.
- ❖ It produces a green pigment composed by fluorescein & pyocyanin that has a characteristic fruity odor.
- ❖ Identification of the organism:

Biochemical tests using NE API system.

Various methods including serologic, phage, aeruginocine typing methods, and molecular testing.



Colonies of *P. aeruginosa* on nutrient agar with characteristic green pigment



Colonies of *P. aeruginosa* on specific Pseudomonas F agar



Pink bacilli of *P. aeruginosa* demonstrated by gram stain



Biochemical identification of *P. aeruginosa* demonstrated by gram stain

DIFFERENTIAL DIAGNOSIS:

It can be differentiated from diseases causing joint swelling, nervous manifestation, CRD disease, E. coli septicaemia, omphalitis, diseases causing eye lesion and face swelling.

PREVENTION AND CONTROL:

- › Prevention and control depends on:
 1. Prevention and control are based on identifying and eliminating the source of the organism.
 2. Good hygiene, especially in hatcheries and when birds are injected, is fundamental to *Pseudomonas* control.
 3. Sensitivity of isolates to hatchery disinfectants needs to be determined.
 4. Cleaning and disinfection of equipment and the use of sterile techniques in preparing vaccines and injectable will control *Pseudomonas* infections resulting from inoculation.
 5. Reduction of stress and the prevention of other viral and bacterial infections will aid in reducing susceptibility to *Pseudomonas*.
 6. Treatment may be of value if it can be applied early after infection. Antibiotics can be useful in reducing but sensitivity testing is essential. Ciprofloxacin, enrofloxacin, and gentamicin can be used.

KLEBSIELLA INFECTION

DEFINITION:

Klebsiella is an environmental contaminant that occasionally causes embryo mortality, yolk sac infections, and mortality in young chickens, turkeys, and ostriches. *Klebsiella* was found to be a contaminant of semen.

Cause:

The genus *Klebsiella* is a member of the family Enterobacteriaceae. *Klebsiellae* are non-motile, rod-shaped, gram-negative bacteria with a prominent polysaccharide capsule. This capsule encases the entire cell surface, accounts for the large appearance of the organism on gram stain, and provides resistance against many host defense mechanisms.

susceptability

Host:

The disease is recorded in chickens, turkeys and ostriches.

Age:

Baby chicks up to two weeks of age were most susceptible to infection with *klebsiella pneumoniae* and *klebsiella ozaenae*, while chickens of month of age or older were resistant to infection

Transmission:

- Contaminated water.
- Contaminated semen.
- Contaminated feed.
- Contaminated hatcheries.

Clinical signs:

- › General signs.
- › Respiratory, ocular, septicemic, and reproductive affections of poultry.
- › Concurrent infection of young turkeys with *K. pneumoniae* increases the severity of respiratory disease, resulting from *Bordetella avium* and *Chlamydia psittaci* infections. *Klebsiella* was isolated from turkey flocks with adenoviral inclusion body tracheitis that experienced respiratory disease and increased mortality.
- › *Klebsiella* and *Staphylococcus aureus* were isolated from a septicemic disease of 20-week old layers experiencing increased mortality, while the organism was isolated infrequently from reproductive diseases including salpingitis and oophoritis in hens
- › Localized and systemic infections with *Klebsiella* occur in young ostriches causing ostrich fading chick syndrome, an often-fatal disease of birds less than 3 weeks old.

Diagnosis:

History, clinical signs and necropsy findings.

Isolation: It can be isolated on Macconkey agar media.

Identification by: Biochemical test using API20E system and molecular typing.



↓ Klebsiella colonies on MacConkey's agar media

Pink rods of Klebsiella spp. by Gram stain

Hygienic handling of semen, hatching eggs, and hatchery sanitation are necessary for the prevention of the losses.

Enrofloxacin, ciprofloxacin , ceftiofur, gentamicin, and trimethopriim/sufadiazine are used to control the infection.

Proteus infection

Proteus is a genus in the family Enterobacteriaceae that inhabits the lower intestinal tract.

Susceptibility:

Proteus occasionally causes embryonic death, yolk sac infections, and mortality in young chickens, turkeys, and ducks.

Transmission:

The organism can penetrate the egg shell, which is facilitated by fecal contamination resulted in embryonic mortality.

Proteus also can be a contaminant of artificially collected semen.

Signs and lesions

Septicemia due to Proteus has occurred in quail, pheasants infected with a pathogenic avian influenza virus and broilers suspected of having immunologic deficiency.

Proteus has been recovered occasionally from a low percent of salpingitis and oophoritis lesions in layers.

P. mirabilis was isolated from the lung, trachea, and kidney of chickens experiencing respiratory signs, diarrhea, paralysis, and high mortality.

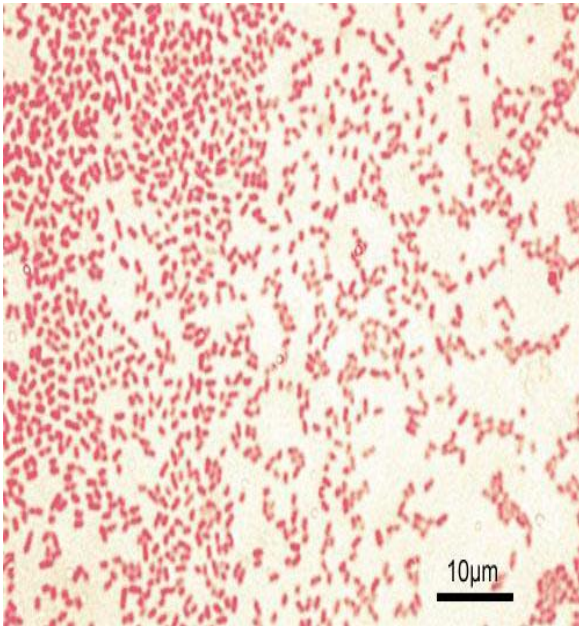
In water fowl, Proteus occasionally can produce arthritis, salpingitis, airsacculitis, and septicemia.

Lab. diagnosis:

- › Diagnosis can be confirmed by:
- ❖ Sampling: from lesions
- ❖ Isolation of the organism: it can be grown readily on common bacteriological media as nutrient agar or macConkey agar media, it has a characteristic swarming properties on media

❖ Identification by:

Gram Stain, biochemical test using API 20E system and molecular typing



Gram negative coccobacilli of Proteus spp. demonstrated by Gram stain



Proteus on nutrient agar showing swarming growth

Prevention and control:

- › Hygienic handling of semen, hatching eggs, and hatchery sanitation are necessary for the prevention of the losses.
- › Antimicrobial testing of 19 Proteus isolates indicated sensitivity enrofloxacin and ceftiofur.
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