



Tikrit University
College of Veterinary Medicine

Pox

Subject name: Poultry Diseases

Subject year:2024-2025

Lecturer name: Ismael I. Hasan

Academic

Email:ismailhasan@tu.edu.iq



Lecturers link



Pox



Summary

Fowlpox is a common disease of poultry seen in many countries. Caused by the fowlpox virus, a DNA virus belonging to the family Poxviridae, the disease is characterized by production losses and cutaneous lesions, and mortality especially when the birds have more generalized forms of the disease.

The mature virus (elementary body) is brick-shaped and measures about 330×280×200nm. The outer coat is composed of random arrangements of surface tubules. Fowlpox virus and other avianpox viruses consist of an electron-dense, centrally located biconcave core or nucleoid and two lateral bodies in each concavity, and are surrounded by an envelope

The main components of FWPV are protein, DNA, and lipid. The virus has a particle weight of 2.04×10^{-14} g and contains 7.51×10^{-15} g protein, 4.03×10^{-16} g DNA, and 5.54×10^{-15} g lipid; nearly one-third of FWPV is lipid.

Susceptibility to Chemical and Physical Agents

Fowlpox virus is known to withstand 1% phenol and 1:1,000 formalin for nine days but is inactivated by 1% caustic potash when freed from its matrix. Heating at 50°C for 30 minutes or 60°C for 8 minutes also inactivates the virus. Trypsin has no effect on the DNA or whole virus. When desiccated, the virus shows marked resistance. It can survive in dried scabs for months or even years.

Public Health Significance: Avianpox is not of public health significance.

Replication

The cytoplasmic site of DNA synthesis and packaging within the infectious virus particle are characteristics of pox viruses. Fowlpox virus contains genes that encode for a DNA ligase, ATP-GTP binding protein, uracil DNA glycosylase, DNA polymerase, DNA topoisomerase, DNA processing factor, and replication-essential protein kinase. In addition, FWPV possesses a gene that encodes for the DNA repair enzyme, CPD photolyase that repairs UV-induced damage to the DNA by using visible light as a source of energy. Replication of avianpox viruses appears to be similar in dermal or follicular epithelium of chickens, ectodermal cells of the

chorioallantoic membrane (CAM) of developing chicken embryos, and embryonic skin cells. Differences in the host cell and virus strain, however, may be reflected in the time scale of replication and virus output. Biosynthesis of FWPV in dermal epithelium involves two distinct phases: a host response characterized by marked cellular hyperplasia during the first 72 hours and synthesis of infectious virus from 72–96 hours postinfection (PI). The replication of viral DNA in dermal epithelium begins between 12 and 24 hours PI and is followed by the appearance of infectious virus later. Epithelial hyperplasia between 36–48 hours PI ends in a 2.5-fold increase in cell numbers by 72 hours PI. The rate of viral DNA synthesis is low during the first 60 hours of infection.

Transmission

Horizontally (Mosquitoes, *Dermanyssus gallinae*)

Incubation Period:

The incubation period of the naturally occurring disease varies from about 4–10 days

Clinical Signs:

- 1-The disease may occur in one of the two forms, cutaneous or diphtheritic, or both.
- 2-Systemic form of infection with high mortality is usually seen in canaries.
- 3-The cutaneous form of the disease is characterized by the appearance of nodular lesions on the comb, wattle, eyelids, and other non-feathered areas of the body
- 4-Cutaneous eye lesions interfere with the bird's ability to find food and water.
- 5-In the diphtheritic form (wet pox), cankers or diphtheritic yellowish lesions occur on the mucous membranes of the mouth, esophagus, or trachea with accompanying coryza-like mild or severe respiratory signs similar to those caused by infectious laryngotracheitis virus infection of the trachea
- 6-Lesions in the corner of the mouth and on the tongue, throat, and upper part of the trachea interfere with eating, drinking, and breathing
- 7-In pullets coming into lay and in older birds, the disease often runs a slow course accompanied by unthriftiness and reduced egg production.
- 8-respiratory distress; loss of feathers and or/ scaly skin on the head, neck, and back; weight loss.
- 9-Egg production is temporarily retarded if layers are infected.
- 10-The course of the mild cutaneous form of disease is about 3–4 weeks,
- 11-Pox in canaries can cause mortality as high as 80–100%.

Gross (P.M.) lesions:

- 1-The characteristic lesion of the cutaneous form of pox in chickens is epithelial hyperplasia involving the epidermis and underlying feather follicles, with formation of nodules that first appear as small white foci and then rapidly increase in size and become yellow.
- 2-In chickens infected intradermally, a few primary lesions appear by the fourth day. Papules are formed by the fifth or sixth day. This is followed by the vesicular stage, with formation of extensive thick lesions
- 3-Lesions may coalesce and become rough and gray or dark brown.
- 4-After about two weeks or sometimes sooner, lesions have areas of inflammation at the base and become hemorrhagic.
- 5-Formation of a scab, which may last for another 1–2 weeks, ends with desquamation of the degenerated epithelial layer.
- 6-If the scab is removed early in its development, there is a moist, seropurulent exudate underneath covering a hemorrhagic granulating surface.
- 7-In the diphtheritic form, slightly elevated, white opaque nodules or yellowish patches develop on the mucous membranes of mouth, esophagus, tongue, or upper trachea.
- 8-Nodules rapidly increase in size and often coalesce to become a yellow, cheesy, necrotic, pseudodiphtheritic, or diphtheritic membrane.
- 9-If the membranes are removed, they leave bleeding erosions. The inflammatory process may extend into sinuses, particularly the infraorbital sinus (resulting in swelling) and also into the pharynx and larynx (resulting in respiratory disturbances) and esophagus.
- 10-In some cases, avianpox virus infection may be characterized by cutaneous, diphtheritic, systemic, and oncogenic manifestations, while in others the infection may be localized and characterized by the presence of small, pale, firm nodules in some internal organs.
- 11-Endothelial lesions and impaired liver functions, partly caused by viral infection and enhanced by secondary bacterial infection, are likely to be more important in the pathogenesis of hemorrhagic diathesis

Histologic changes:

- 1-The most important feature of infection (whether the lesion is cutaneous, diphtheritic, systemic, or from infected CAM) is hyperplasia of the epithelium with enlargement and ballooning of infected cells, as well as associated inflammatory changes.

2-Characteristic eosinophilic A-type cytoplasmic inclusion bodies (Bollinger bodies) are observed by light microscopy in infected cells

3-Because pox viruses are the largest among viruses, the elementary bodies can be observed in smears prepared from the lesions after staining by the Gimenez method or with Wright's stain.

4-Histopathologic changes of tracheal mucosa include initial hypertrophy and hyperplasia of mucus-producing cells, with subsequent enlargement of epithelial cells that contain eosinophilic cytoplasmic inclusion bodies

5-These inclusion bodies stain green with acridine orange, indicating DNA in the inclusions

6-Inclusion bodies may be present in various stages of development, depending on the time after infection, and may occupy almost the entire cytoplasm, with resulting cell degeneration.

Diagnosis:

1-Clinical signs and gross and histologic lesions. 2-virus isolation 3- RT-PCR. 4-ELISA

Differential Diagnosis

Marek disease, ILT

Treatment

1-Antibiotics: 2-Anti-inflammatory:3-Supplements: 4-Local antiseptics

Vaccination

Vaccines of fowlpox and pigeonpox virus origin are routinely used for vaccination of chickens and turkeys in areas where the disease is endemic. These should contain a minimum concentration of 10^5 EID₅₀/ml to establish satisfactory takes for good immunity. A vaccine vial should be opened immediately before use. Only one vial should be opened at a time, and the entire contents should be used within two hours. After the vaccine is prepared, the vaccinator's hands should be washed thoroughly. Fowlpox vaccine is commonly applied by the wing-web method to 4-week-old chickens and to pullets about 1–2 months before egg production is expected to start. It is also used to revaccinate chickens held for the second year of egg production. The vaccine is not to be used on hens while they are laying.

The flock should be examined about 7–10 days after vaccination for evidence of takes. A "take" consists of swelling of the skin or a scab at the site where the vaccine was applied and is evidence of successful vaccination. Immunity normally develops 10–14 days after vaccination.

Although studies on in ovo administration of FWPV vaccines to 18-day-old chicken embryos have provided encouraging results, it is not being used widely.