



Beyond Vaccination: Managing the Continuing Threat of Fowl Pox

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Fowl pox is a widespread viral disease affecting domestic and wild birds. It is caused by fowlpox virus (FWPV), a double-stranded DNA virus belonging to the genus *Avipoxvirus* of the family *Poxviridae*. The disease occurs worldwide and is particularly common in tropical and subtropical regions, where warm conditions and insect vectors favour transmission.

Fowl pox can cause reduced growth in young birds, decreased egg production in layers and increased mortality in severe cases. Transmission occurs mainly through direct contact, contaminated materials and mechanical vectors such as mosquitoes and other blood-feeding insects. Backyard and free-range poultry are particularly vulnerable because of greater exposure to vectors and limited biosecurity (Giotis et al., 2019; WOA, 2023).

Although vaccination remains the principal preventive measure, outbreaks can occur in vaccinated flocks because of inadequate vaccination, poor vaccine application, insufficient immunity or variation among



field virus strains (Biswas et al., 2011). The disease occurs mainly in two forms: cutaneous (dry) and diphtheritic (wet). The cutaneous form produces lesions on unfeathered skin,

whereas the diphtheritic form affects mucous membranes of the mouth and respiratory tract and may cause severe respiratory distress.

Etiology and Virus Characteristics

Fowl pox is caused by FWPV, a member of the genus *Avipoxvirus*. The mature virus particle is characteristically brick-shaped and contains an outer envelope, a central biconcave core and lateral bodies. Its large linear double-stranded DNA genome is

approximately 288 kb and contains numerous genes involved in viral replication, host interaction and pathogenicity (WOAH, 2023; Minhas et al., 2024).

The virus is relatively resistant to environmental conditions and may persist in contaminated poultry houses, equipment and organic material. Therefore, proper cleaning, disinfection and sanitation are important components of disease prevention.

Epidemiology and Transmission

Fowl pox can affect birds of different ages, breeds and production systems. Transmission occurs primarily through:

- Direct contact between infected and susceptible birds
- Contaminated equipment and materials
- Infected scabs and feather debris
- Skin injuries and mechanical inoculation
- Mosquitoes and other blood-feeding insects

Mosquitoes can act as important mechanical vectors, and detection of FWPV in field-collected mosquitoes supports their role in natural transmission (Yeo et al., 2019).

Backyard and free-range poultry are at increased risk because of greater exposure to insects, environmental contamination and other birds. However, outbreaks may also occur in commercial poultry farms. Infection in vaccinated flocks has been reported, demonstrating that vaccination alone may not completely prevent disease under all field conditions (Matos et al., 2022).

Pathogenesis and Clinical Signs

FWPV is primarily epitheliotropic, producing epithelial hyperplasia, inflammation, degeneration and necrosis at sites of infection.

1. Cutaneous Form

The cutaneous or dry form is characterized by:

- Nodular and wart-like lesions
- Thick scab formation
- Lesions on the comb, wattles, eyelids, legs and other unfeathered areas
- Reduced feeding and general performance

Histologically, lesions may show epidermal hyperplasia, acanthosis, ballooning degeneration, hyperkeratosis and characteristic eosinophilic intracytoplasmic inclusion bodies known as Bollinger bodies (Mohamed et al., 2024).

The cutaneous form is generally less severe but may result in secondary bacterial infections and reduced productivity.

2. Diphtheritic Form

The diphtheritic or wet form affects the mucous membranes of the mouth, pharynx, larynx and sometimes the trachea. Thick proliferative and necrotic membranes may develop and interfere with feeding and respiration.

Severe respiratory obstruction can result in respiratory distress and death due to asphyxiation. The severity of disease depends on the virus strain, age and immune status of the bird and the presence of secondary infections (Surendar et al., 2025).

Both cutaneous and diphtheritic forms may occur simultaneously.

Diagnostic Techniques

Diagnosis is based on clinical signs, characteristic lesions and laboratory confirmation. Important diagnostic approaches include:

Clinical Examination: Identification of typical skin nodules, scabs and diphtheritic lesions.

Histopathology: Detection of characteristic Bollinger bodies in affected epithelial cells.

Virus Isolation: FWPV can be isolated using embryonated chicken eggs or suitable avian cell cultures.

PCR And Real-Time PCR: Molecular assays, particularly those targeting conserved genes such as **P4b**, provide rapid and sensitive detection of FWPV.

Serological Tests: Virus neutralization, agar gel immunodiffusion (AGID) and ELISA can be used to assess antibody responses, vaccination status and flock exposure (WOAH, 2023).

Differential Diagnosis

Fowl pox should be differentiated from other diseases producing similar skin, oral or respiratory lesions.

- **Infectious Laryngotracheitis:** Characteristic intranuclear inclusion bodies help distinguish it from fowl pox, which produces cytoplasmic inclusion bodies.
- **Trichomoniasis:** Diphtheritic lesions in pigeons may resemble lesions caused by *Trichomonas gallinae*.
- **Nutritional Deficiencies And Toxin Exposure:** These may produce skin abnormalities resembling pox lesions.

Histopathological examination and appropriate molecular or microbiological tests are useful for confirmation (Tripathy and Reed, 2020).

Control and Prevention

Effective control requires an integrated approach rather than vaccination alone. Important measures include:

1. Effective vaccination using appropriate vaccines and correct administration techniques.
2. Strict biosecurity to minimize introduction and spread of infection.
3. Regular cleaning and disinfection of poultry houses, equipment and contaminated areas.
4. Vector control to reduce mosquito and biting-insect populations.
5. Avoidance of overcrowding and maintenance of good ventilation.
6. Prompt isolation of affected birds to reduce transmission.
7. Monitoring of vaccination success, including proper observation of the vaccine "take."
8. Surveillance and molecular characterization of circulating field strains.

Vaccination

Vaccination is the primary preventive measure against fowl pox. Live attenuated vaccines are commonly produced using chicken embryos or tissue-culture systems. Vaccines are generally administered through the wing-web method, and development of a characteristic local "take" is used as an indication of successful vaccination.

Booster vaccination may be necessary in layers and breeders depending on the production system and disease risk. Vaccine handling, storage, administration and timing are critical for achieving effective immunity.

Recombinant fowl pox viruses are also being investigated and used as vaccine-vector platforms for other poultry diseases, including Newcastle disease,

avian influenza and infectious laryngotracheitis (Giotis et al., 2019; Minhas et al., 2024).

Beyond Vaccination: The Way Forward

The continuing occurrence of fowl pox despite vaccination highlights the need for a multilayered disease-control strategy. Vaccination should be combined with vector management, biosecurity, sanitation, early diagnosis and regular surveillance.

Particular attention is required in backyard and free-range poultry systems, where interaction with wild birds and insect vectors can increase the risk of virus transmission. Molecular surveillance of field strains can also help identify emerging variants and improve understanding of vaccine protection.

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Conclusion

Fowl pox remains an important viral disease of poultry, particularly in backyard and poorly managed production systems. Its persistence is associated with environmental contamination, mechanical insect vectors and occasional disease occurrence in vaccinated flocks.

Vaccination remains the foundation of prevention, but it should not be considered a stand-alone solution. Effective biosecurity, vector control, sanitation, early diagnosis and continuous surveillance are essential for reducing disease losses. Greater molecular characterization of circulating field strains will further support the development of improved prevention and control strategies.

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