



VMC 321: Systematic Veterinary Virology

Avipox virus

Dr Manoj Kumar
Assistant Professor
Department of Veterinary Microbiology
Bihar Animal Sciences University



Taxonomy

- Family: *Poxviridae*
- Subfamily: *Chordopoxvirinae*
- Genus: *Avipoxvirus*
- Species: *Fowlpox virus*

APVs include



- Fowl pox virus (FPV),
- Canary pox virus (CPV)
- Turkey pox virus (TPV)
- Pigeon pox virus (PPV)
- Junco pox virus
- Mynah pox virus
- Starling pox virus
- Psittacine pox virus
- Quail pox virus
- Crow poxvirus
- Peacock pox virus
- Penguin pox virus
- Alala pox virus
- Apapane pox virus
- Condor pox virus
- Sparrow pox virus

Morphology




- Fowlpox virus is the largest of the animal viruses.
- Consist of six rectangular surfaces arranged into three dimensional shape is brick-like
- Or they appear as flattened oval bodies, the axes of which have the ratio 1.4:1. 8:3.0

Contd...

- The virus particles have a complex structure consisting of an internal central mass, the nucleoid, surrounded by two membrane layers.
- Fowlpox virus genome is haploid deoxyribonucleic acid (DNA) type single molecule of linear double stranded DNA; 280 kbp in size



- 
- Fowlpox virus is stable & survive in the dried state.
 - Survive at room temperature for about a year.
 - Inactivate by heating for twenty minutes at 50°C ., or eight minutes at 60°C.
 - Resistant to ether but sensitive to chloroform.
 - The fowlpox virus withstands treatment with phenol diluted 1:100 or formalin for nine days.



Antigens

- The antigens of fowlpox virus are composed of a complex of proteins in which at least two components are recognized;
- these are soluble or LS antigen and nucleoprotein (NP) antigen
- "NP" antigen appears to contain a group antigen common to all viruses of the poxvirus group

Cultivation of Fowlpox virus

- Sources of living cells for fowl poxvirus growth are:
 - Susceptible birds
 - Embryonated chicken eggs via chorioallantoic membranes (CAM)
 - Cell cultures of avian origin
 - chicken embryo fibroblast (CEF)
 - chicken embryo dermis (CED)
 - chicken embryo kidney CEK
 - duck embryo fibroblasts (DEF).

Cultivation in
natural host.



- Avipoxvirus could be isolated in SPF chicken



Cultivation of avipoxvirus in chicken embryo

Uninfected CAM

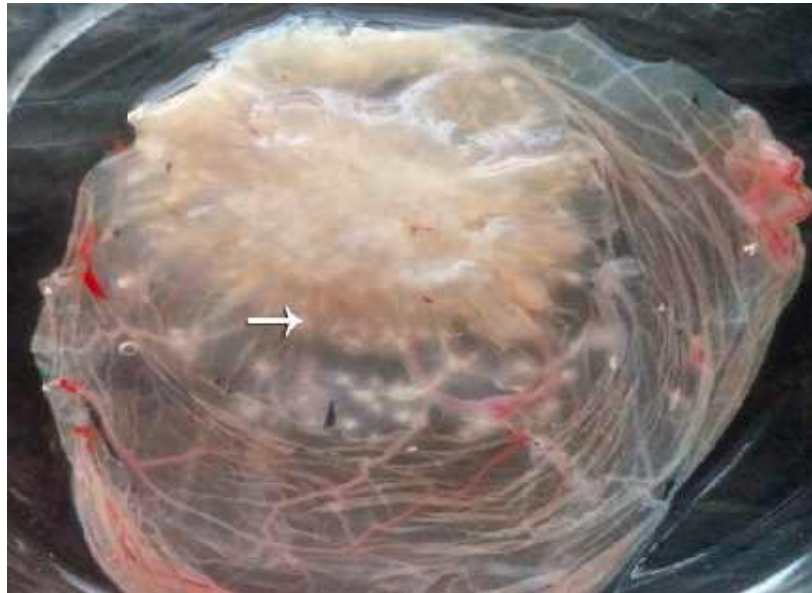


Pock lesions on infected CAM

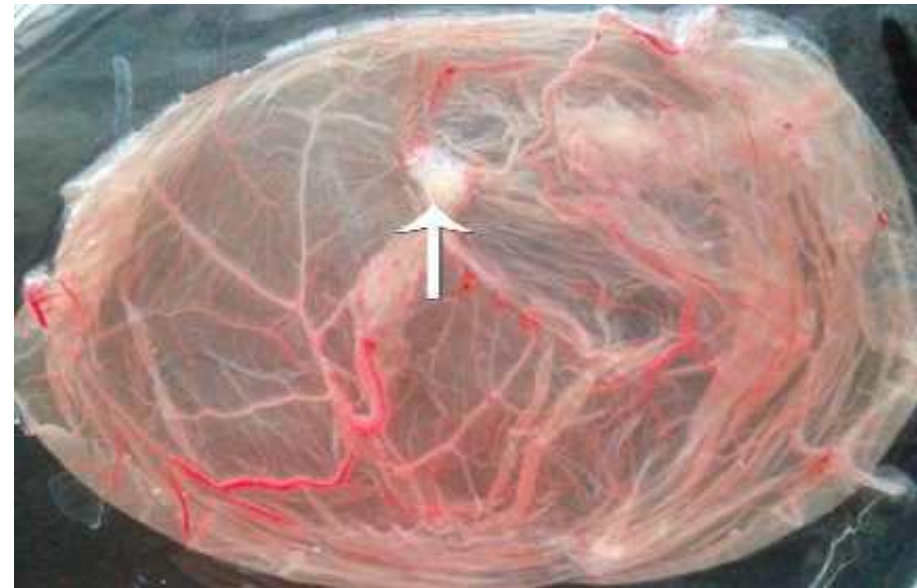


Cultivation of avipoxvirus in chicken embryo

Pock lesions and oedema on infected CAM

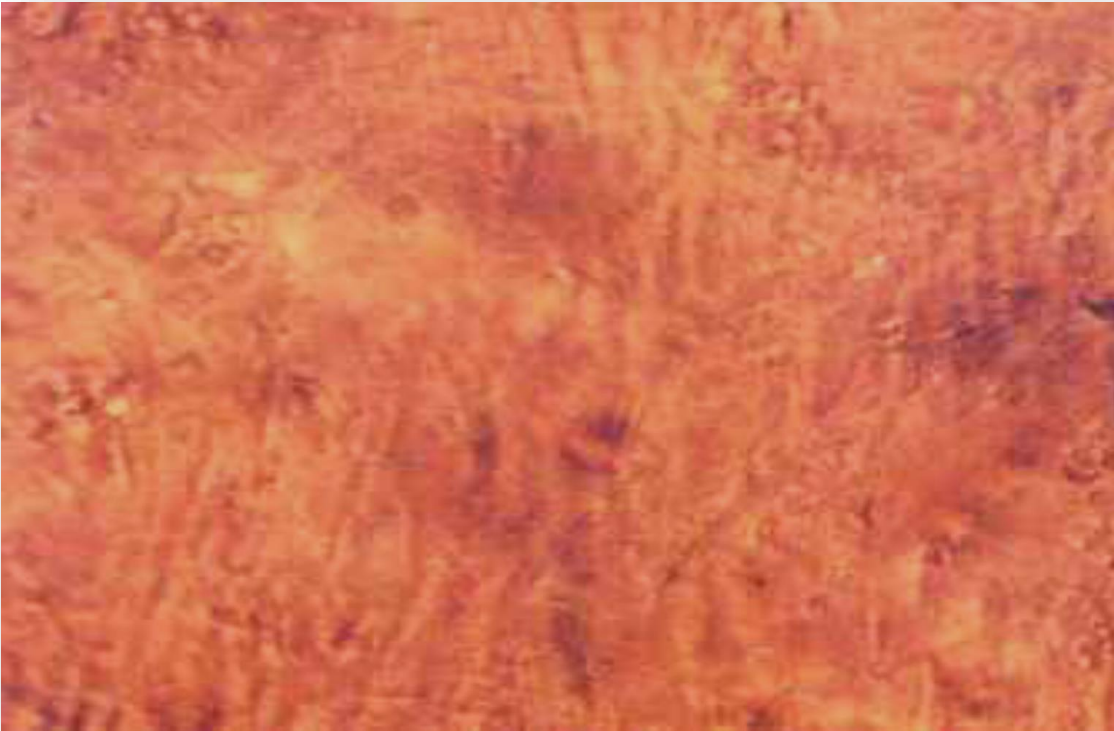


Haemorrhagic pock lesions on infected CAM

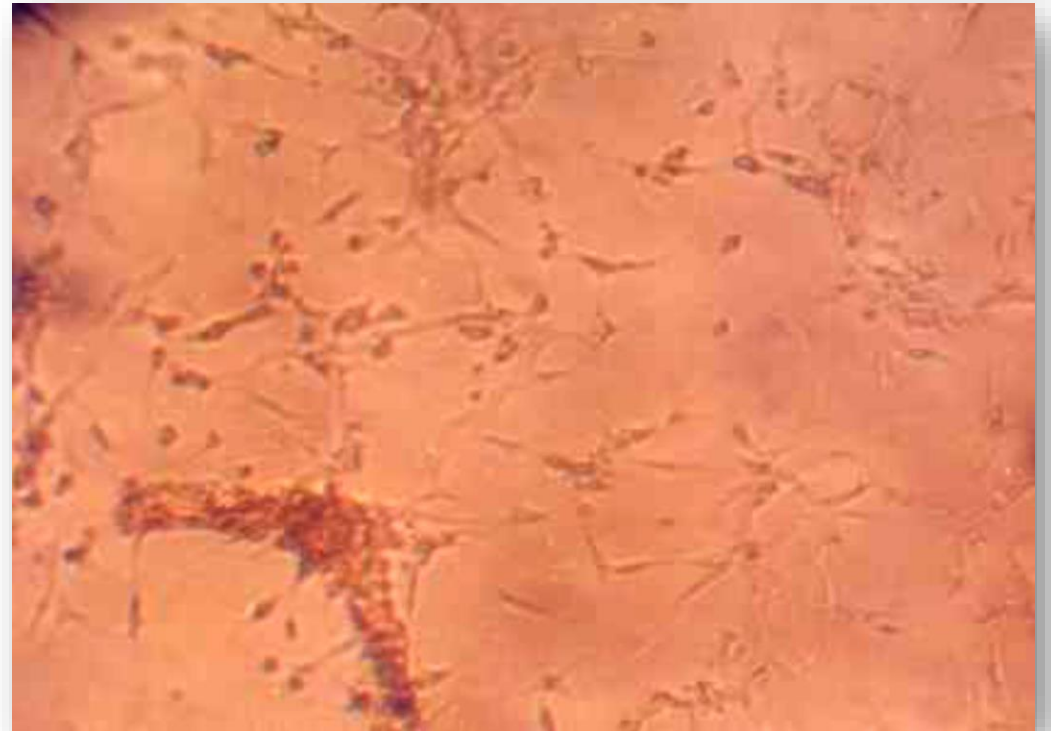


Cultivation in Chicken embryo

Normal CEF cell culture



CPE induced by pox virus in CEF cell culture





Fowl pox

History

- **Bollinger** (1873) and **Borrel** (1904) - first to demonstrated visual diagnosis by a relationship between histologic lesions and structure of inclusion bodies
- **Woodruff** and **Goodpasture** (1930) conclusively demonstrated avian poxvirus as etiological agent and its association with intracytoplasmic inclusion bodies in the affected epithelial cells

Fowl Pox

Synonym:

Avian Diphtheria, Bird Pox, Contagious Epithelioma, Poxvirus Infection, Poxvirus Avium, Avian Pox

Definition

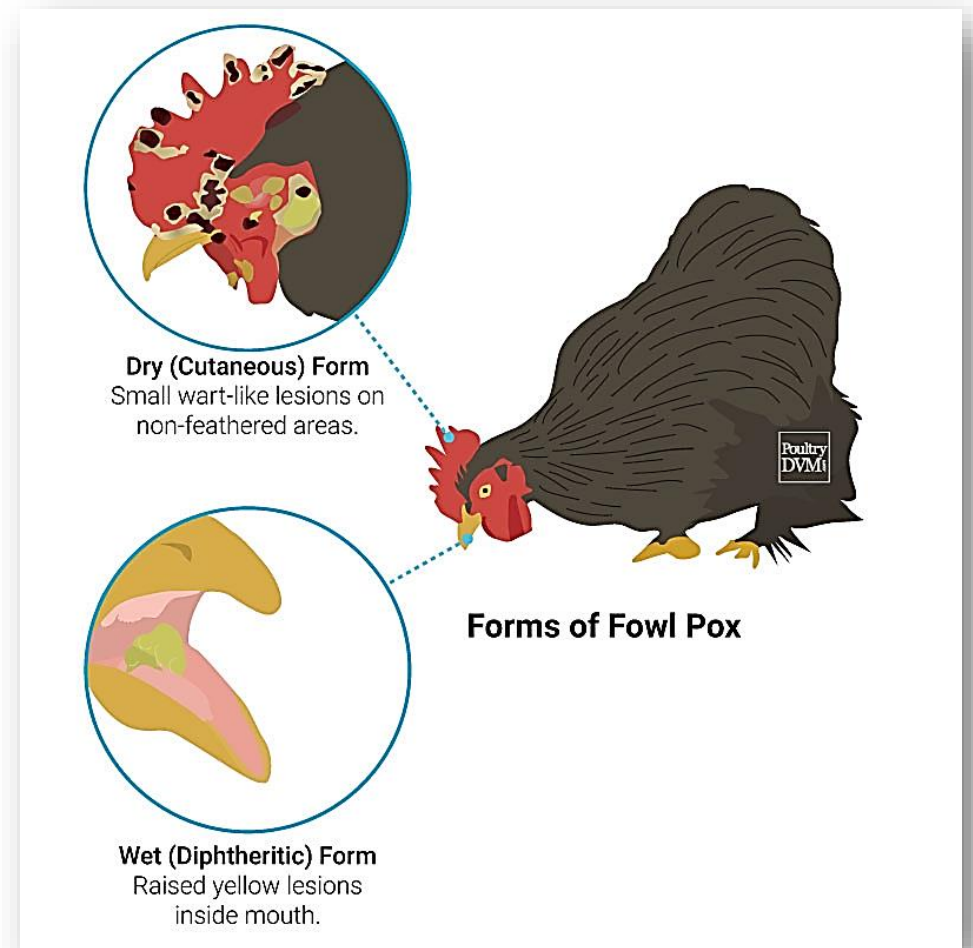
“Fowl pox is a slow-spreading viral disease of chickens characterized by lesions on the unfeathered skin areas and/or mucous membranes of the oral cavity, larynx, or trachea.”

Avian poxvirus classified into three different strains or types

- i. Fowl poxvirus (FPV) that affects chickens and turkeys,
- ii. Pigeon poxvirus (PPV) that occurs in pigeons
- iii. Canary poxvirus (CPV) that affects different species of wild birds.
 - Each virus strain can only cause disease within certain species of birds.
 - For example- chickens are not affected by infection with pigeon pox virus, and vice versa.

Forms of Fowl Pox

- Two different forms of fowl pox
 - Dry (cutaneous) form
 - Wet (diphtheritic) form



Fowl pox virus

EXPOSURE

INCUBATION PERIOD: 10-14 days

COURSE OF ILLNESS: 3-5 WEEKS

POSSIBLE COMPLICATIONS

TRANSMITTED INTO FLOCKS BY:



DRY FORM

Small whitish foci which turn into raised, wart-like nodules on unfeathered areas.



Transition into scabs and fall off within 2 weeks.

Secondary bacterial or fungal infections.

With eye involvement:

- Conjunctivitis
- Keratitis
- Vision impairment

WET FORM

Canker-like lesions in the oral cavity and trachea.



Reduced appetite
Difficulty breathing

With trachea involvement:

- Asphyxiation

Cutaneous or "dry" pox form- most common

Typical pox lesions

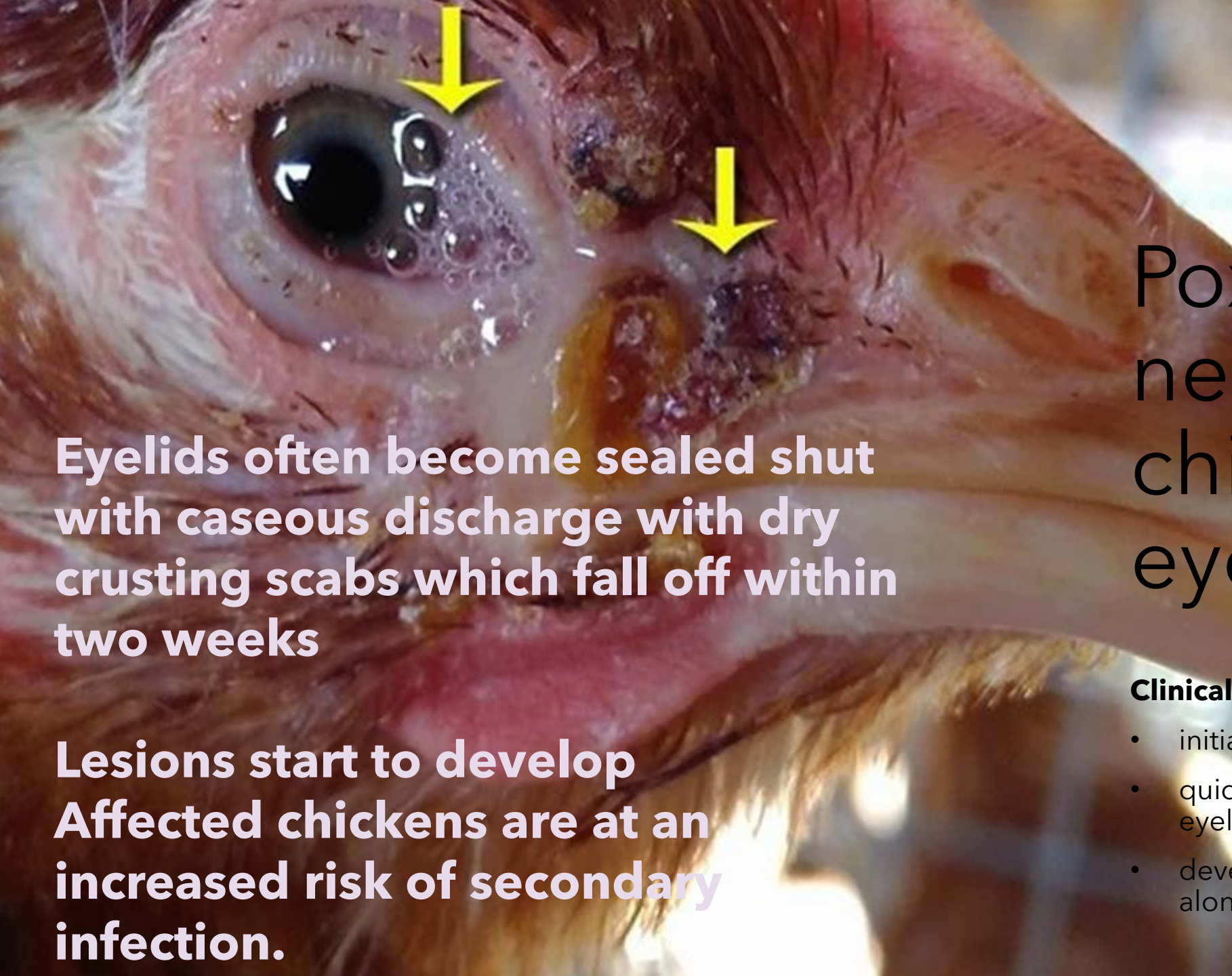
- Small, wart-like growths on the skin of unfeathered areas (face, comb, wattles, eyelids, legs, and feet)
- Initially appear as small, yellow eruptions which gradually increase in size.
- Pox lesions will also change color as they grow larger, and turn into dark brown, roughened, dry scabs.
- Scabs will usually last about 2 to 4 weeks, after which they will loosen and drop off on their own, leaving smooth scar tissue underneath
- Dry scabs contain the poxvirus and are highly infectious to other flock members.



NODULES ARE
CHARACTERISTIC
OF FOWL POX.



FOWL POX
CAN ALSO
ENTAIL
SWOLLEN,
WATERY
EYES.



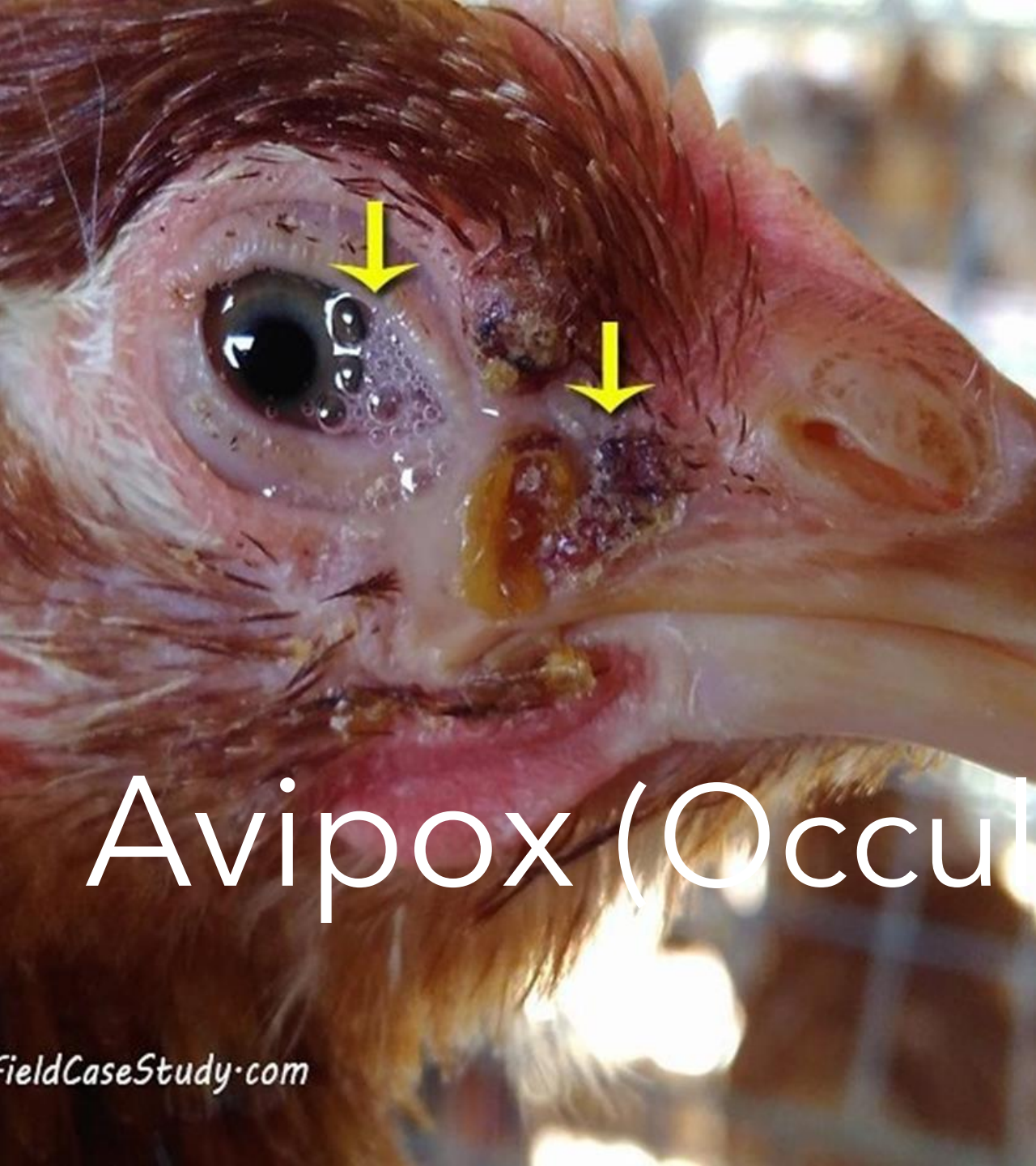
Eyelids often become sealed shut with caseous discharge with dry crusting scabs which fall off within two weeks

**Lesions start to develop
Affected chickens are at an increased risk of secondary infection.**

Pox lesions near the chicken's eyes

Clinical signs

- initially mild redness and irritation
- quickly progress to swelling of the eyelid
- development of ulcerative lesions along the edges of the eyelid.



Avipox (Ocular form)

Diphtheritic (wet pox) form

- Associated with higher mortality in birds
- Plaques (also referred to as yellow canker lesions) develop within the oropharynx (inner mouth and throat) of birds.
- Lesion start out as tiny white nodules which merge together to form raised-yellow white cheesy patches.
- Lesions located in the upper digestive and respiratory tract may cause chickens to reduce their feed intake and have difficulty swallowing.
- Other respiratory signs may also be apparent, depending on the severity which can range from mild to severe.



Cuteaneus for of fowl pox

Yellow mass deposited in mouth
and eye socket



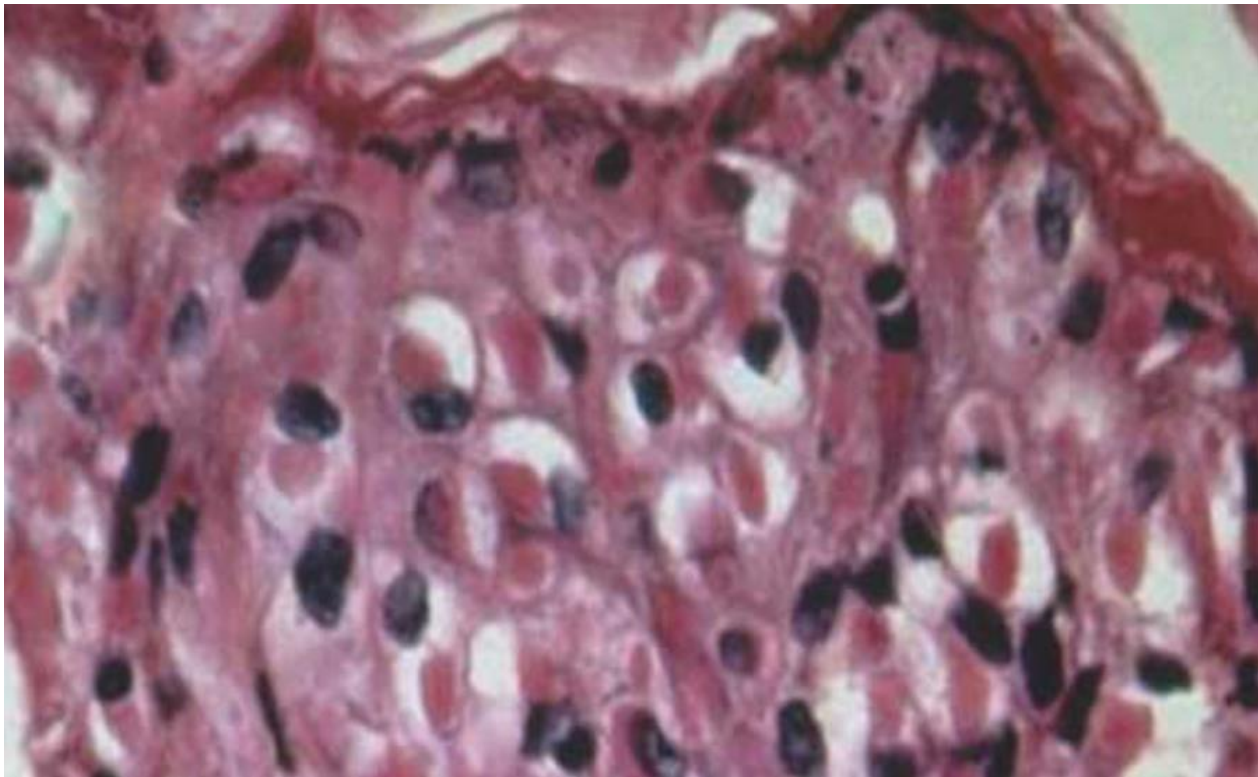
Diphtheretic form of fowl pox



Transmission

- Through biting arthropods (primarily mosquitoes)
- Introduction of a new bird into the flock who is latently infected with the virus.

Inclusion bodies



- **Bollinger bodies** : large intracytoplasmic inclusions
- **Borrel bodies** : elementary bodies occur inside the Bollinger bodies.

Chronology of infection

Time Post Infection	Pathological changes	
	Gross	Microscopic
Hours		
12	Erytherma	i) Dermal hyperaemia and edema
24		ii) Epidermal and follicular hyperplasia
		iii) No inclusions
Days		
2		
3		
4	Tender elevated lesions papules (some vesicles)	i) Cytoplasmic acidophilic inclusions in brick cells and in follicular and sinus epithelium
5		
7		ii) Proliferative and necrobiotic epithelial changes.
10	Vesicles (some ulcers)	i) Pastular and ulcerative lesions ii) No inclusions
14	Pustules and ulcers	i) Pustular and ulcerative lesions ii) Active granulation tissue iii) No inclusions
21	Crusts	i) Scarce tissue (healing stage)



DIAGNOSIS

SIT DOLOR AMET

Diagnosis

Virus isolation

Real-time PCR

Serological diagnosis

- Virus neutralisation
- Agar gel immunodiffusion
- Immunofluorescence
- Passive haemagglutination tests
- Enzyme-linked immunosorbent assay
- Immunoblotting.



Prevention

Preventive prophylaxis– Biosecurity

Medical prophylaxis– vaccination

Vaccination

- **Modified live fowl pox virus vaccines**
- **Route:** Using wing-web stick method
- **Chicks:** Vaccination of at 12-16 weeks of age.
- **Layer:** 1-2 months before egg production with fowlpox attenuated live vaccine.
- Vaccination annually 1-2 months before mosquito season.



A close-up photograph of a person's hands holding an open book. The book is open to two pages of text, and the person's fingers are visible at the edges of the pages. The background is dark and out of focus. Overlaid on the image is the text 'Further reading' in a large, white, sans-serif font.

Further reading

Pox; Chapter 10,

Diseases of Poultry, 12th Edition, Blackwell Publishing Ltd.

9600 Garsington Road, Oxford OX4 2DQ, UK



THANKS