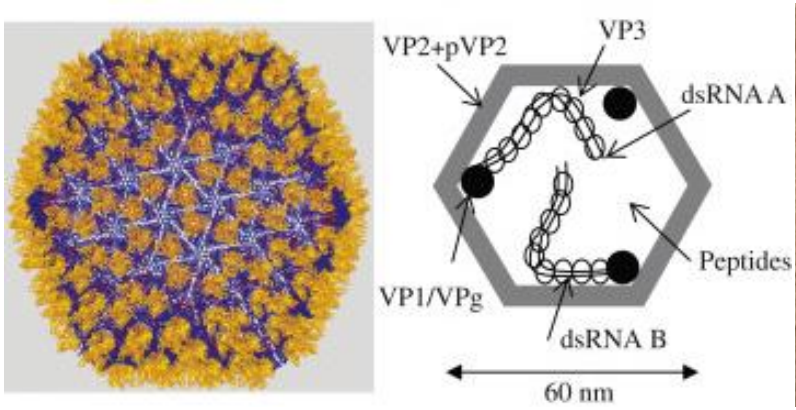
Birnaviridae

Infectious Bursal Disease



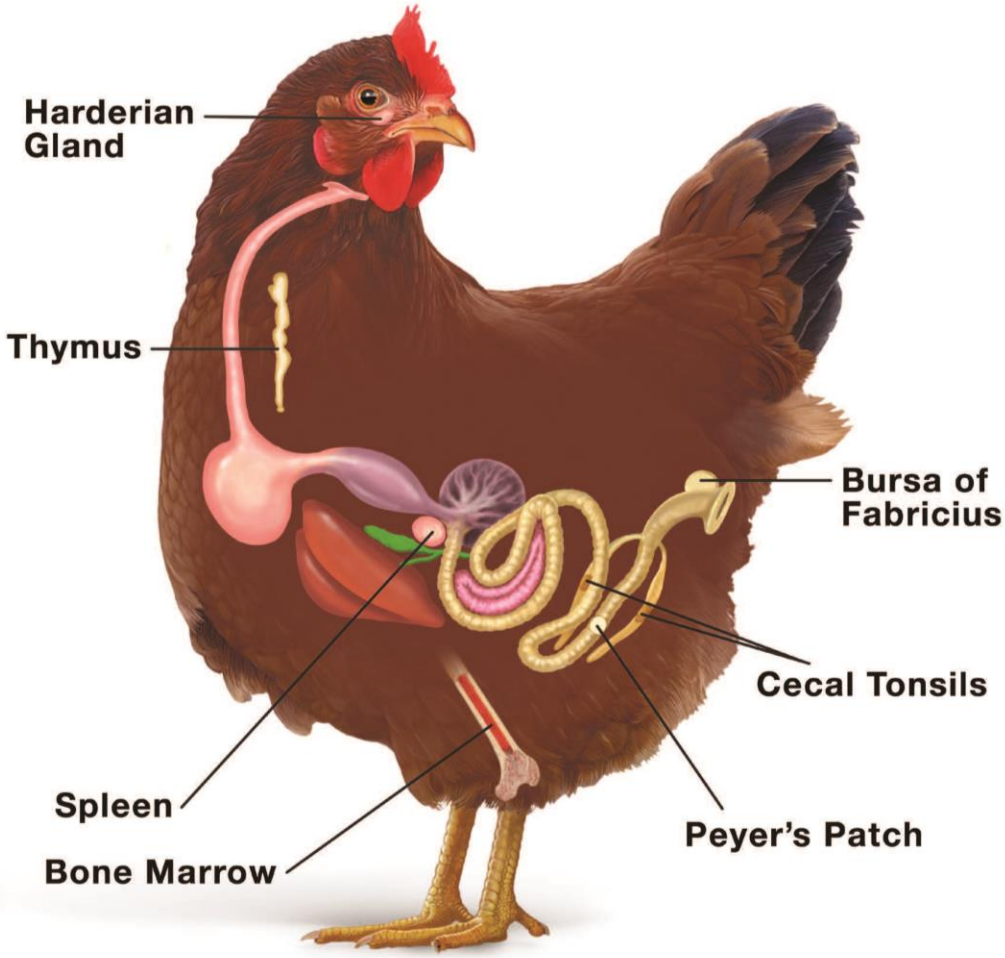
Family Birnaviridae

Aquabirnavirus includes viruses that infect fish, crustaceans and mollusks. Included is the virus that causes **infectious pancreatic necrosis** of salmonoid fish.

Avibirnavirus infects birds.
Only one species **infectious bursal disease** (IBD),
There are two serotypes of IBD virus:
Type 1 strains cause **IBD**; type 2 strains are not pathogenic.

Blosnavirus Blotched snakehead Fish virus

Entomobirnaviruses includes viruses that infect insects.

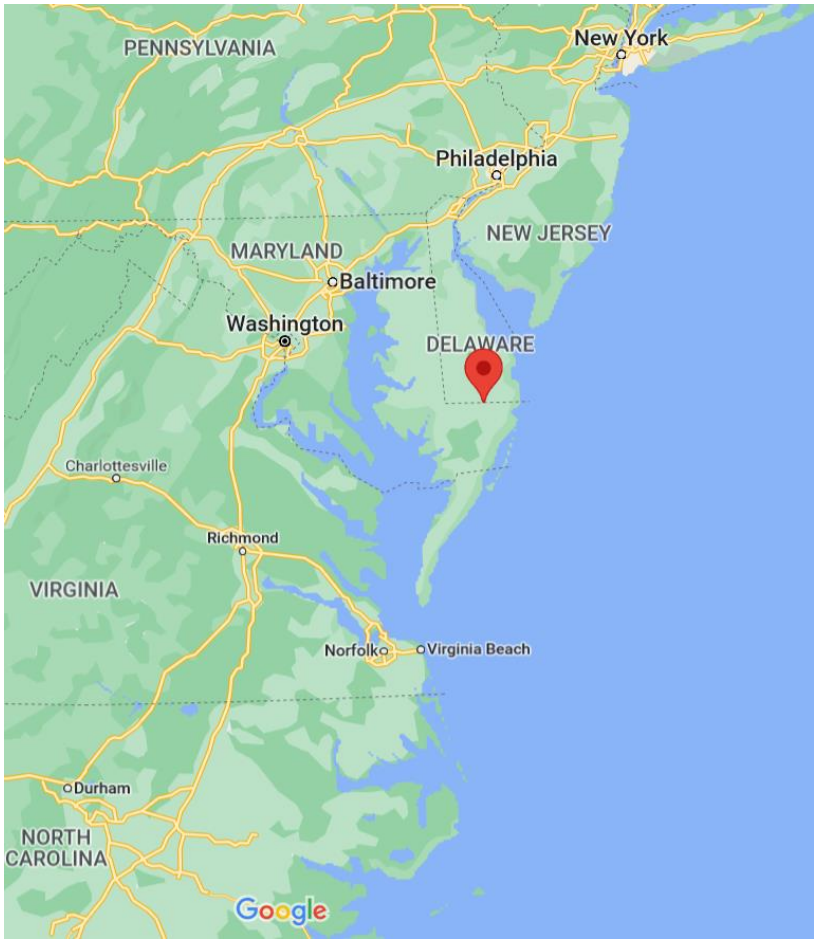


Infectious Bursal Disease

Infectious Bursal Disease

(Gumboro Disease)

First Recognized in 1962 in an outbreak in Gumboro, Delaware



Birnaviridae : Infectious Bursal Disease Virus

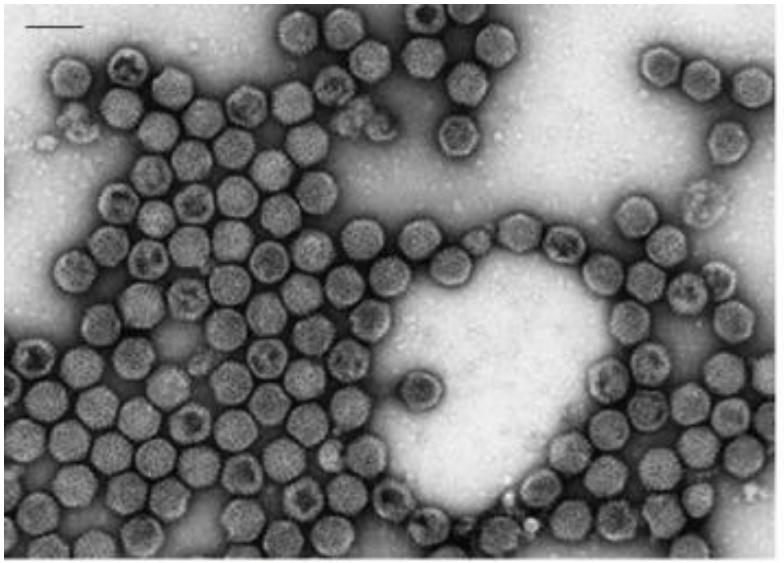
- Virions are **nonenveloped**, hexagonal in outline, **60 nm** in diameter, **icosahedral symmetry**

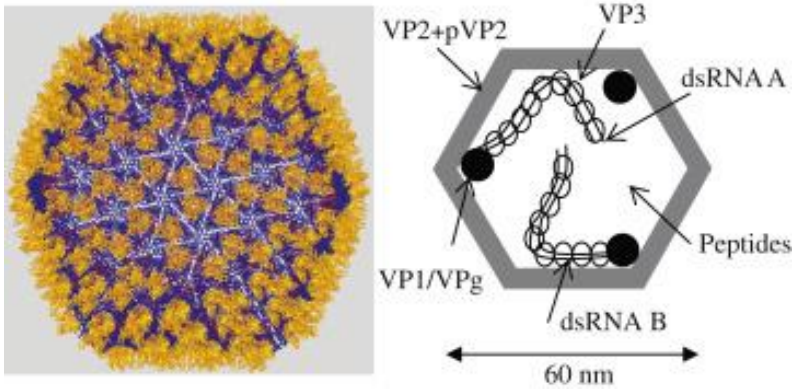
- The genome -two molecules of linear double stranded RNA, designated A and B, 6 kbp in overall size (A, 3.2 kbp; B, 2.8 kbp)

- Structural proteins: VP2, VP3, VP4
- one nonstructural protein :

  Seg B- VP1 RNA Dependent RNA polymerase (transcriptase)

  VP5 -Segment A also encodes a 17 kDa non-structural protein VP5, membrane protein plays an important role in pathogenesis, resulting in cell disruption and virion release.
- **Cytoplasmic replication**
- Survives at 60~ for 60 minutes
- Stable at pH 3 to pH 9
- Sensitive to





Infectious Bursal Disease
(Gumboro Disease)

Occurrence

- Infectious bursal disease is a frequently occurring, worldwide infection of chickens.
- The disease strikes young chickens at 3–6 weeks of age.
- Layer type chickens are more susceptible to vvIBDV than broiler type

Transmission

- The virus is sheded in the feces. **Faeco-oral route** and **inhalation** are the major routes of entry of the virus
- Transmission is by direct contact and indirectly by fomites.
- The primary organ of predilection is **bursa of Fabricius** (BF) where majority of the **B cells are in actively dividing sta**ge in young chicks

PATHOGENESIS OF IBDV

The pathogenesis of IBDV can be described as in the following flow chart.

Fecal/ Oral Route/ Inhalation

↓

Virus replicates in gut and associate with microphages and lymphoid cells

↓

Results in primary viremia through portal circulation

↓

Virus spreads to Bursal Fabricusin 11 hours of post inoculation

↓

Active replication of virus in Bursal follicles and B cells

↓

Spreads to bloodstream and causes secondary viremia

↓

Leads to viralinfection in organs like muscles, kidney causing pathognomic clinical signs and death

↓

The principal target cells are B lymphocytes

Faeco-oral route and inhalation are the major routes of entry of the virus

Replicates in gut-associate macrophages and lymphoid cells and results in primary viremia through portal circulation.

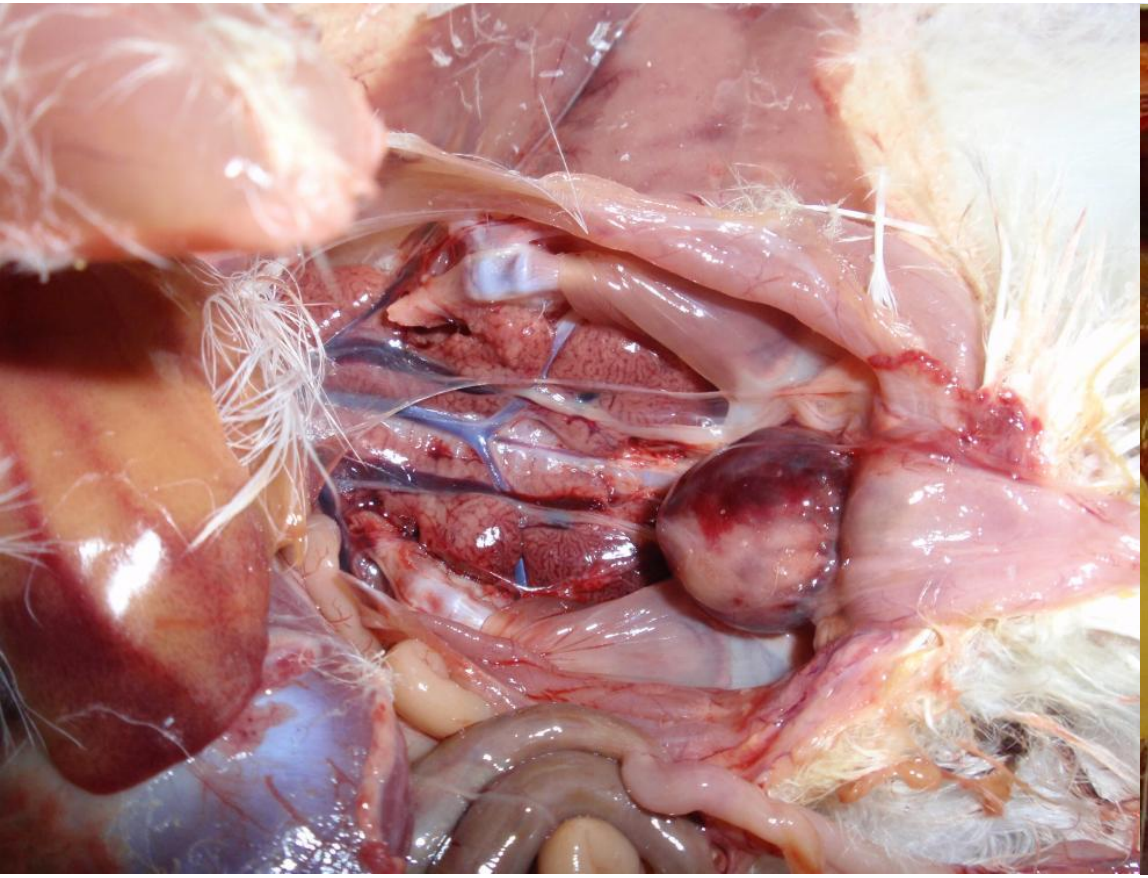
Following **primary viremia**, the virus reaches BF by 11-hr post inoculation and after active replication in bursal follicles and B cells, the virus enters the bloodstream to cause **secondary viremia**.

This leads to **spread of the virus in other organs like kidneys and muscle tissue** that leads to pathognomonic clinical signs and death. Following infection of the BF, degeneration and **necrosed B-cell follicles** especially IgM+ cells are detected.

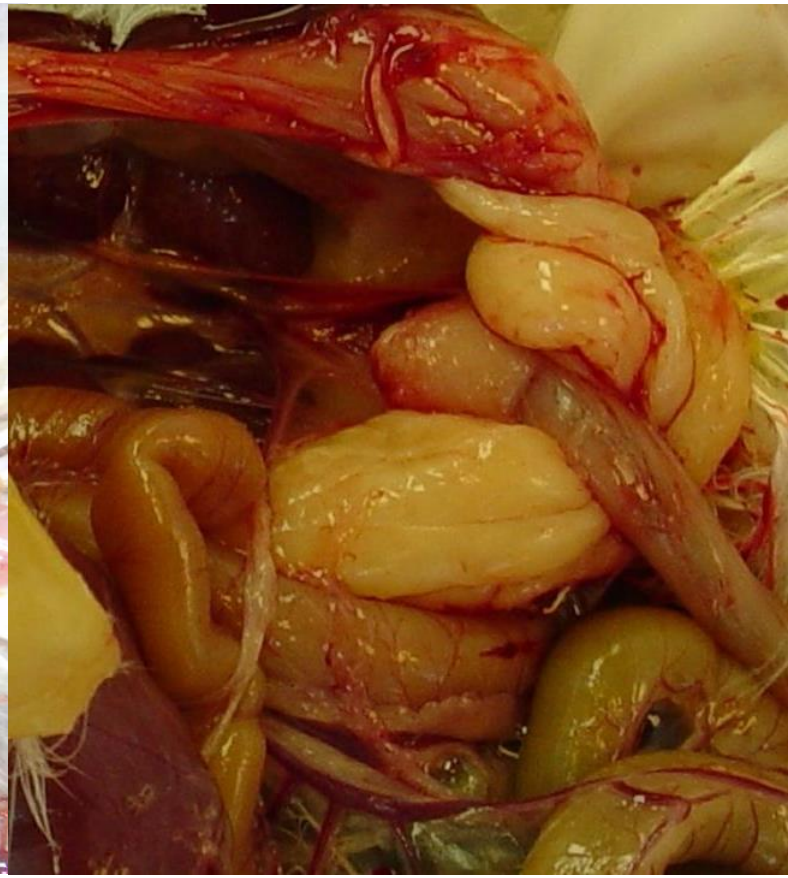
Splenomegaly, **petechial hemorrhages on the mucosa at the juncture of the proventriculus** and **diffused hemorrhages in the thigh and breast muscles**.

Lesions in the caecal tonsils, thymus, spleen and bone marrow confirm infection with vvIBDV, with the **harderian gland** being severely affected following infection in the day-old chicks. Repopulation of B cells in the BF happen in the recovered birds.

Infectious Bursal Disease
(Gumboro Disease)



Enlarged bursa of Fabricius, infectious bursal disease virus, chicken



Atrophic bursa of Fabricius, infectious bursal disease virus, chicken

Infectious Bursal Disease
(Gumboro Disease)

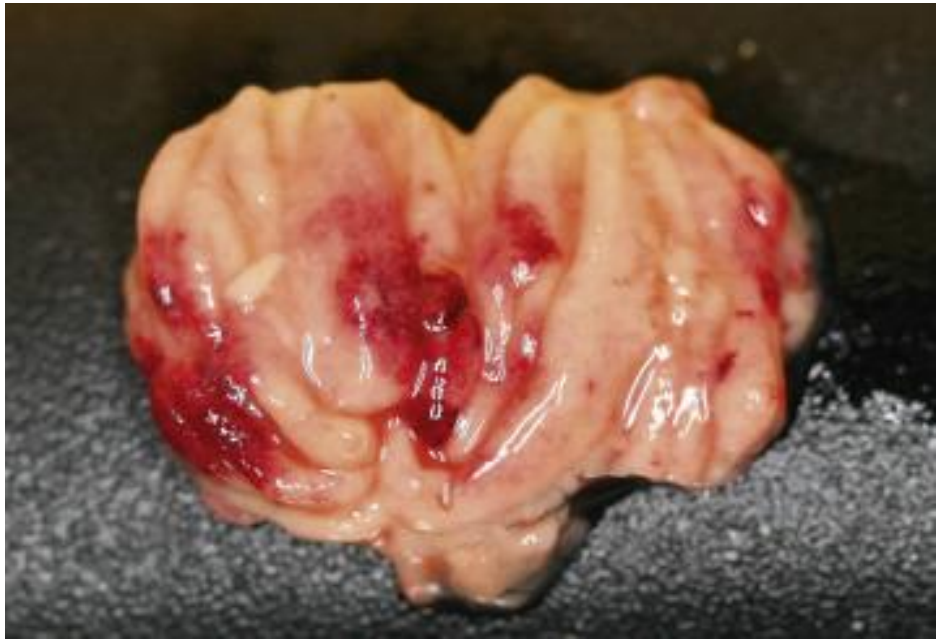
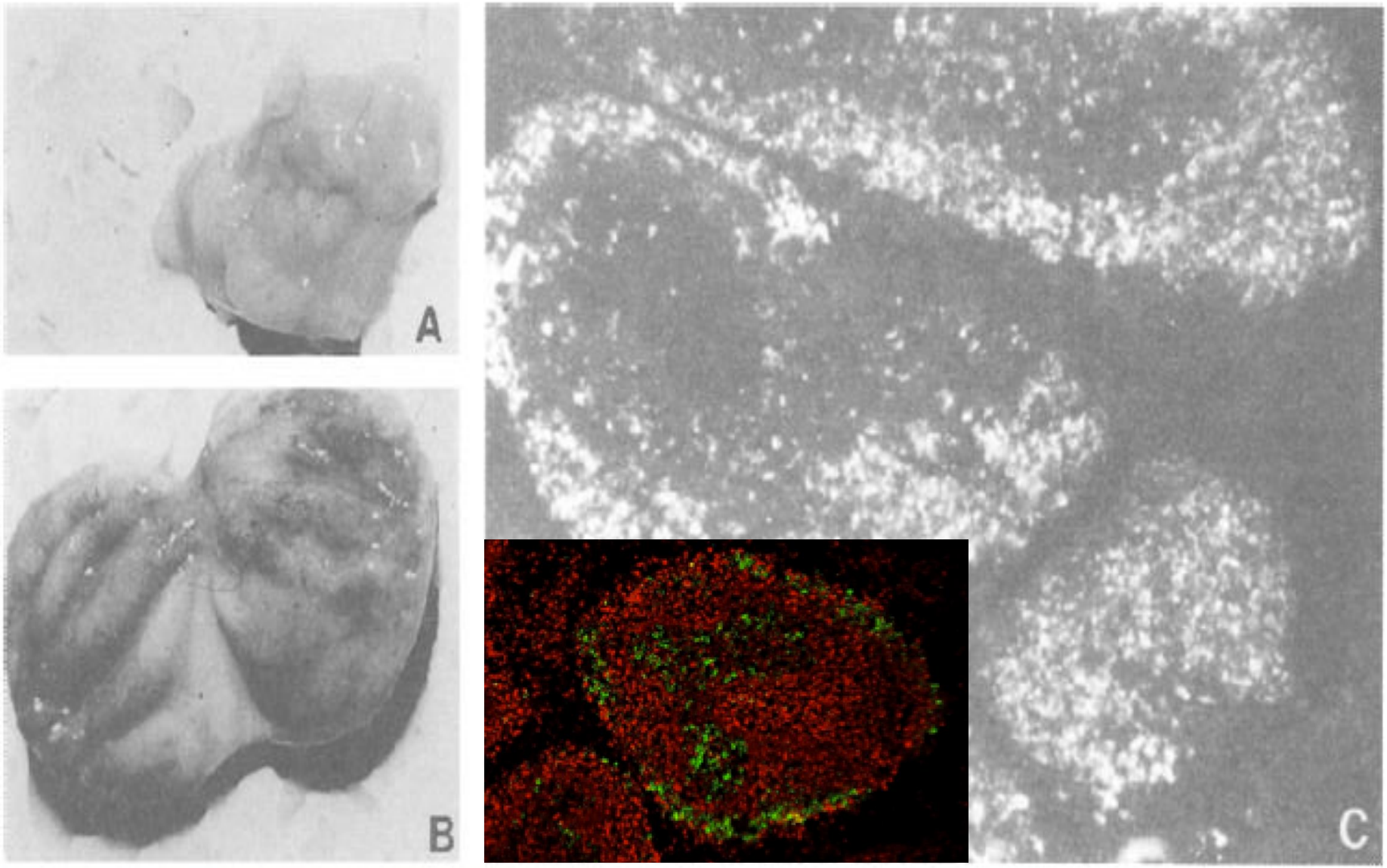
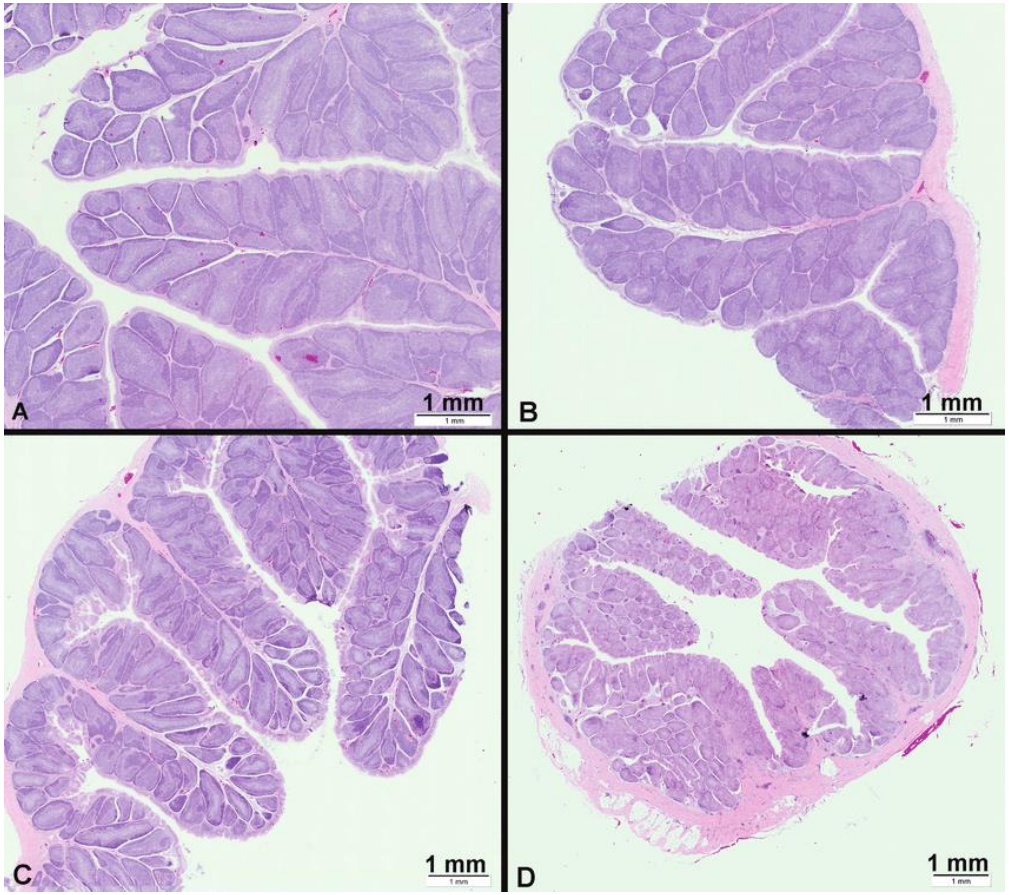


Figure. Infectious bursal disease. Swollen, edematous, and hemorrhagic cloacal bursa from an infected chicken, with superficial hemorrhage.



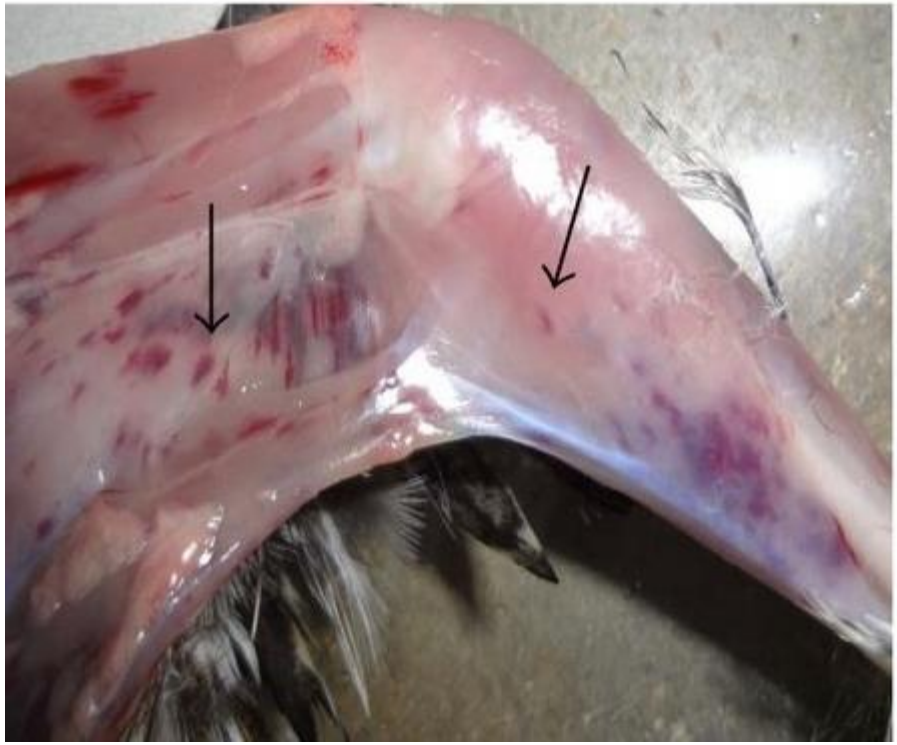
Infectious bursal disease. (A) Normal bursa of Fabricius. (B) Enlarged, hemorrhagic bursa of Fabricius of a diseased chick. (C) Specific immunofluorescence in the follicles of the bursa of Fabricius in a chick infected with infectious bursal disease virus at 24 hours postinfection. (C, courtesy of H. Becht.)

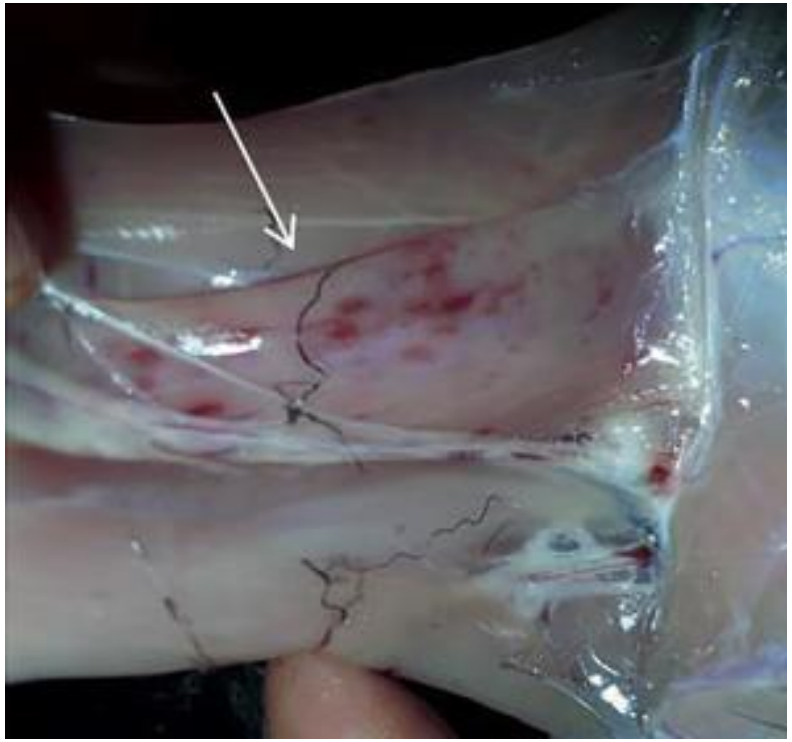
Infectious Bursal Disease
(Gumboro Disease)



Histopathological appearance of bursa of Fabricius (BF) at 23: A-normal follicles of BF; B-mild bursal atrophy-follicular atrophy of some follicles; C-moderate bursal atrophy-small lymphoid follicles and prominent interfollicular architecture; D-severe bursal atrophy-the entire BF architecture shows severe, diffuse loss of follicles.

Infectious Bursal Disease
(Gumboro Disease)





Showing haemorrhages on the thigh and leg Marked-Haemorhages

Haemorhages : Blood coagulation disorder Thrombocytopenia

Infectious Bursal Disease
(Gumboro Disease)

Clinical Signs

- The disease is **highly contagious** for young chickens (usually 3 - 14 weeks),
- Characterized by **swelling and edema of the bursa of Fabricius**.

Diarrhea, anorexia, **depression**, vent picking, and prostration.

- Incubation period : 2-3 days
- Morbidity 100%
- Mortality ranges from 10 to about 60%. (Higher in layers)

- Loss is mainly due to poor weight gains of broilers, permanent impairment of immune system.
- Lesions in lymphoid tissues are characterized by degeneration of lymphocytes in medullary areas.

- **Haemorhages on muscles-** Characteristic.

Infectious Bursal Disease

(Gumboro Disease)

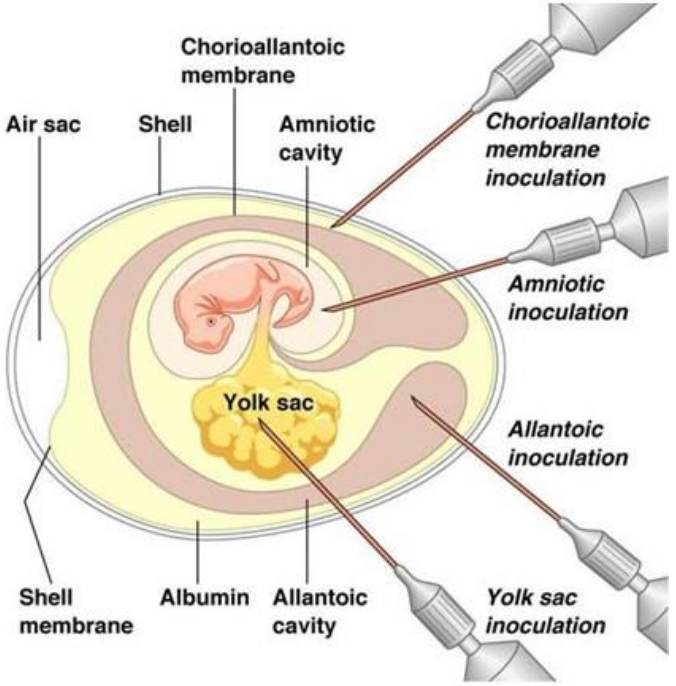
Diagnosis

1. Virus Isolation - IBD Virus

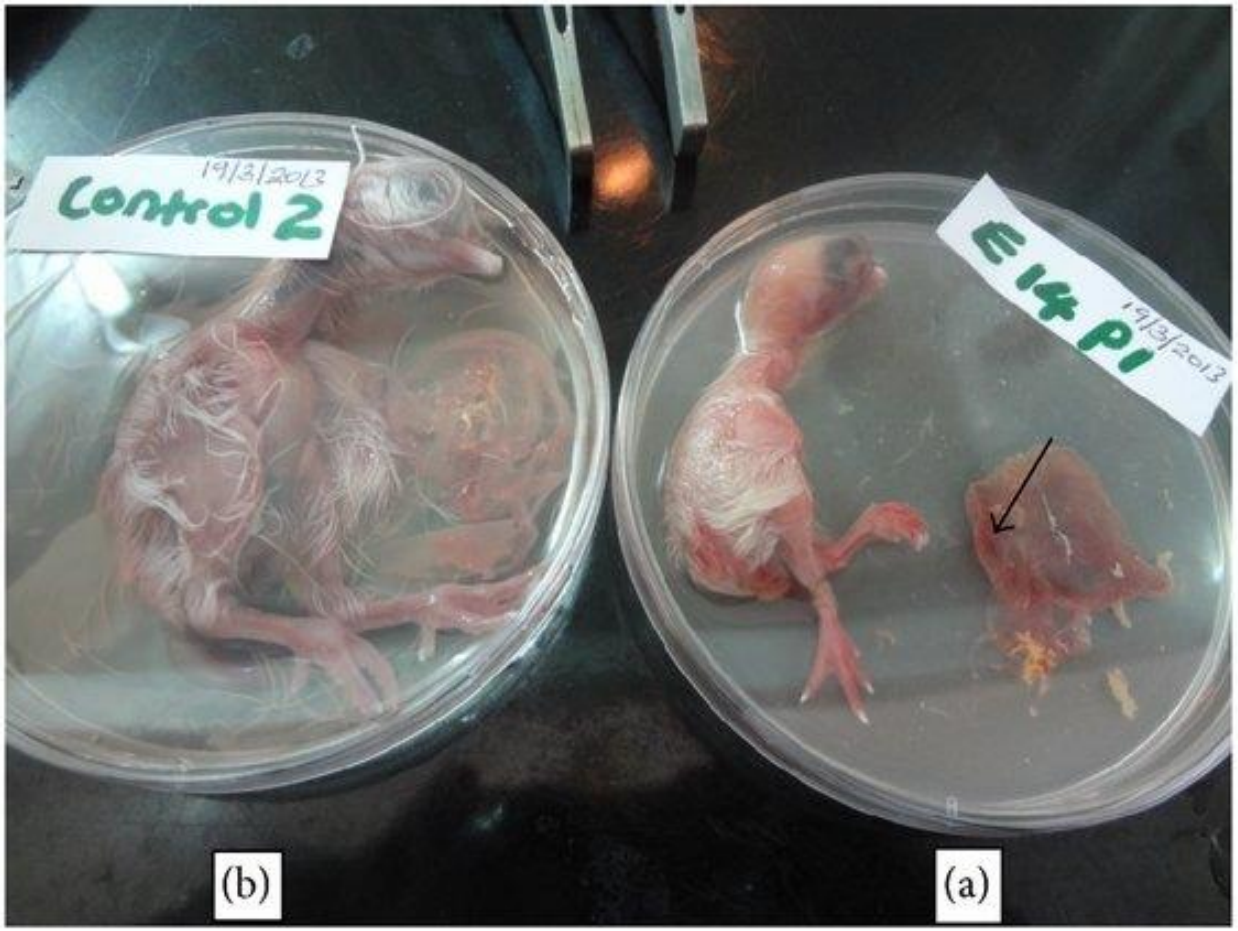
9-11 day-old embryonated chicken eggs CAM (SPF)

Dwarfing of the embryo, subcutaneous oedema, congestion and haemorrhages. The liver is usually swollen, with patchy congestion producing a mottled effect. In later deaths, the liver may be swollen and greenish, with areas of necrosis. The spleen is enlarged and the kidneys are swollen and congested, with a mottled effect.

Cell cultures (CEF)

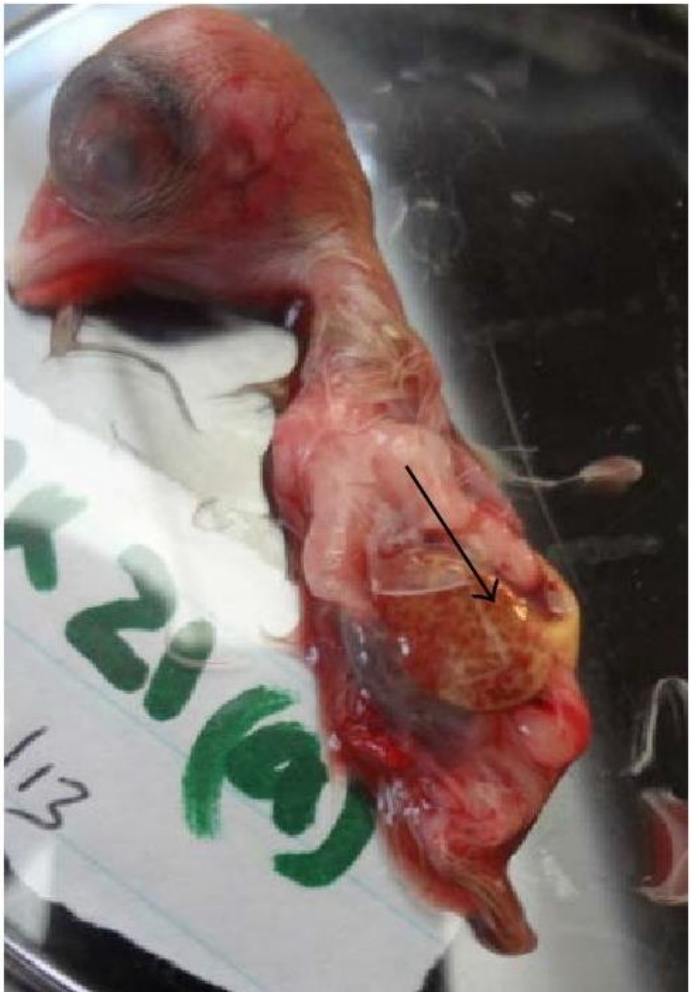


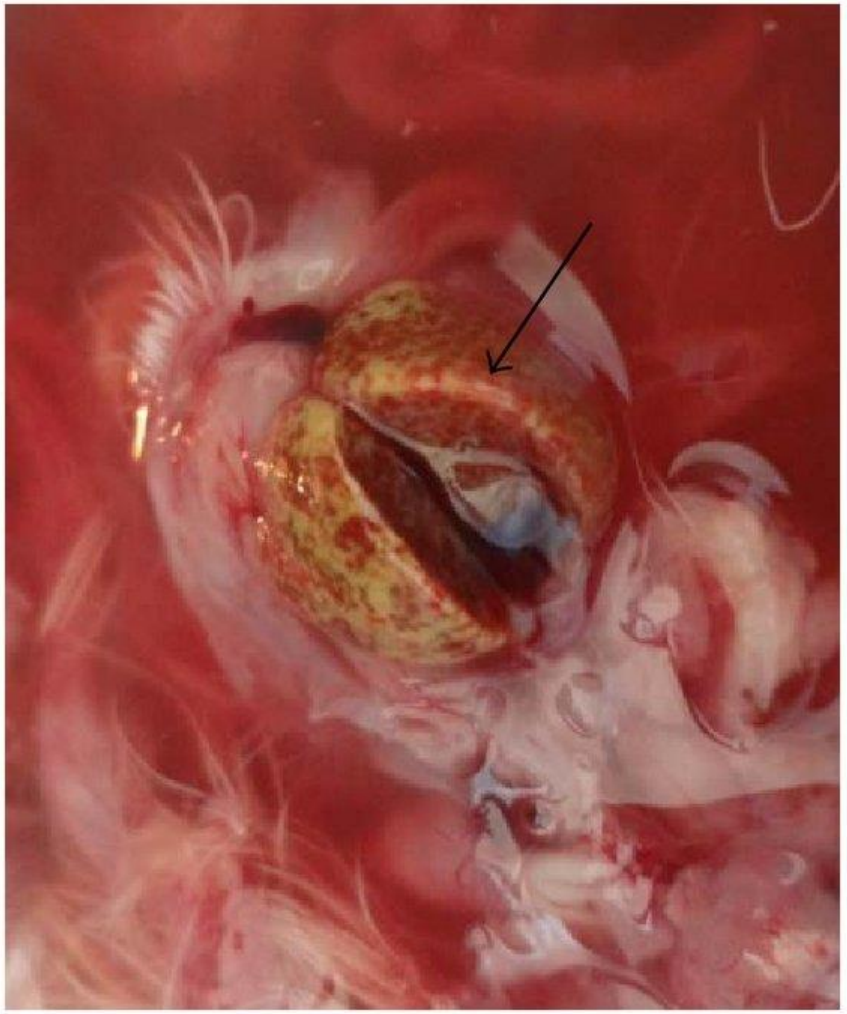
Infectious Bursal Disease
(Gumboro Disease)



Eighteen-day-old dwarf congested IBDV infected embryo (a) with haemorrhagic chorioallantoic membrane (black arrow in (a)) as compared to the uninfected 18-day-old control (b).

Infectious Bursal Disease
(Gumboro Disease)



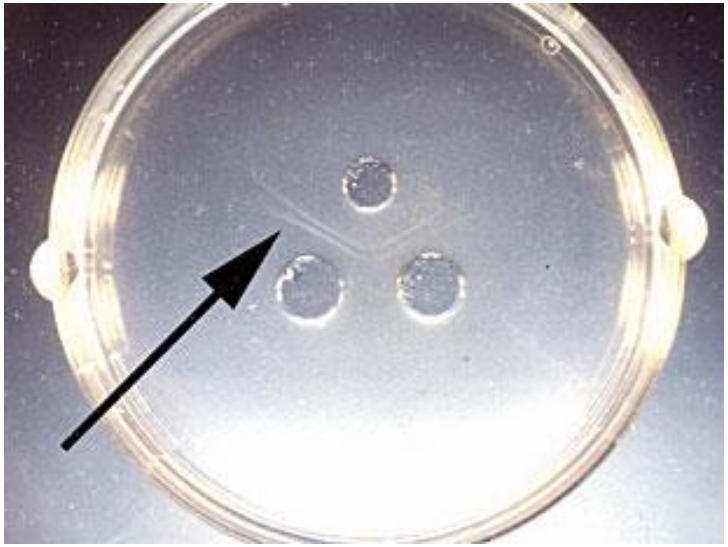


Swollen liver with patchy congestion and pale yellow-green colouration producing a mottled effect (black arrows in (a and b); (b) a closer view of the liver) in an indigenous chicken embryo inoculated with **infectious bursal disease virus**.

Diagnosis

2. Detection of viral antigens

Agar gel immunodiffusion (AGID) test detects the antigen in the bursa by placing the minced bursa from susceptible chicks in the wells of the AGID plate against known positive serum. Freeze-thaw cycles of the minced tissue release the IBDV antigens from the tissue and the freeze-thaw exudate is used to fill the wells.



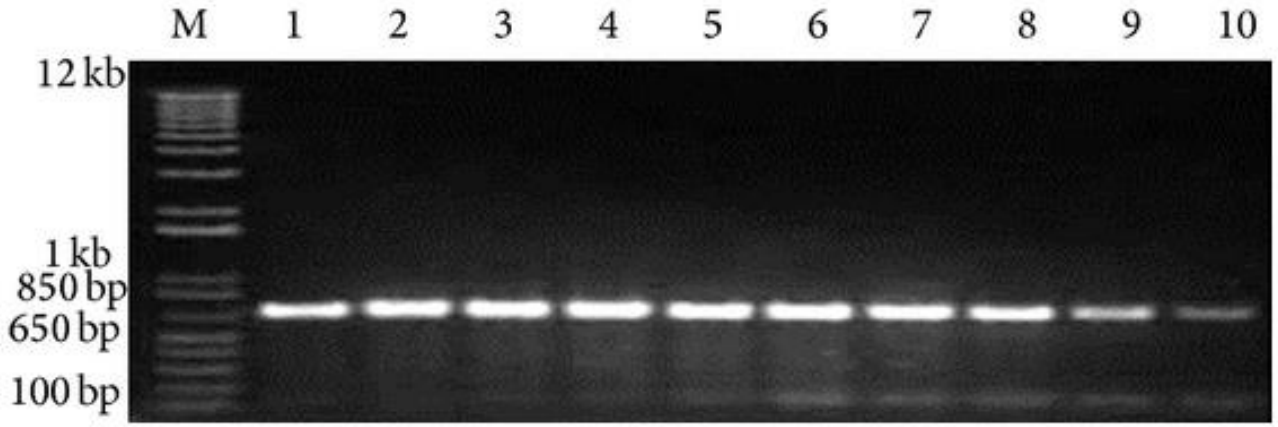
Antigen-capture-ELISA was described for the detection of serotype 1 IBDV in which the ELISA plates were coated with mouse anti-IBDV monoclonal antibodies (Mabs) or chicken anti-IBDV polyclonal

3. Virus Neutralization test: VNT has the highest specificity and at the same time, it correlates with protection.

Diagnosis

4. Molecular diagnostic tests

Sequencing the hVP2 gene together with pathogenicity testing in chickens is the most accurate and accepted method for identifying the IBDV strains. The amplification of hVP2 gene by reverse transcription PCR (RT-PCR) followed by sequencing and phylogenetic analysis represents the only valuable tool for the classification of IBDV strains.



RT-PCR amplified products of 723 bp fragment of VP2 gene of field isolates from lanes 1–8 of IBDV in 1% agarose gel electrophoresis. M: molecular marker (1 KB plus DNA ladder).

Real-time RT-PCR

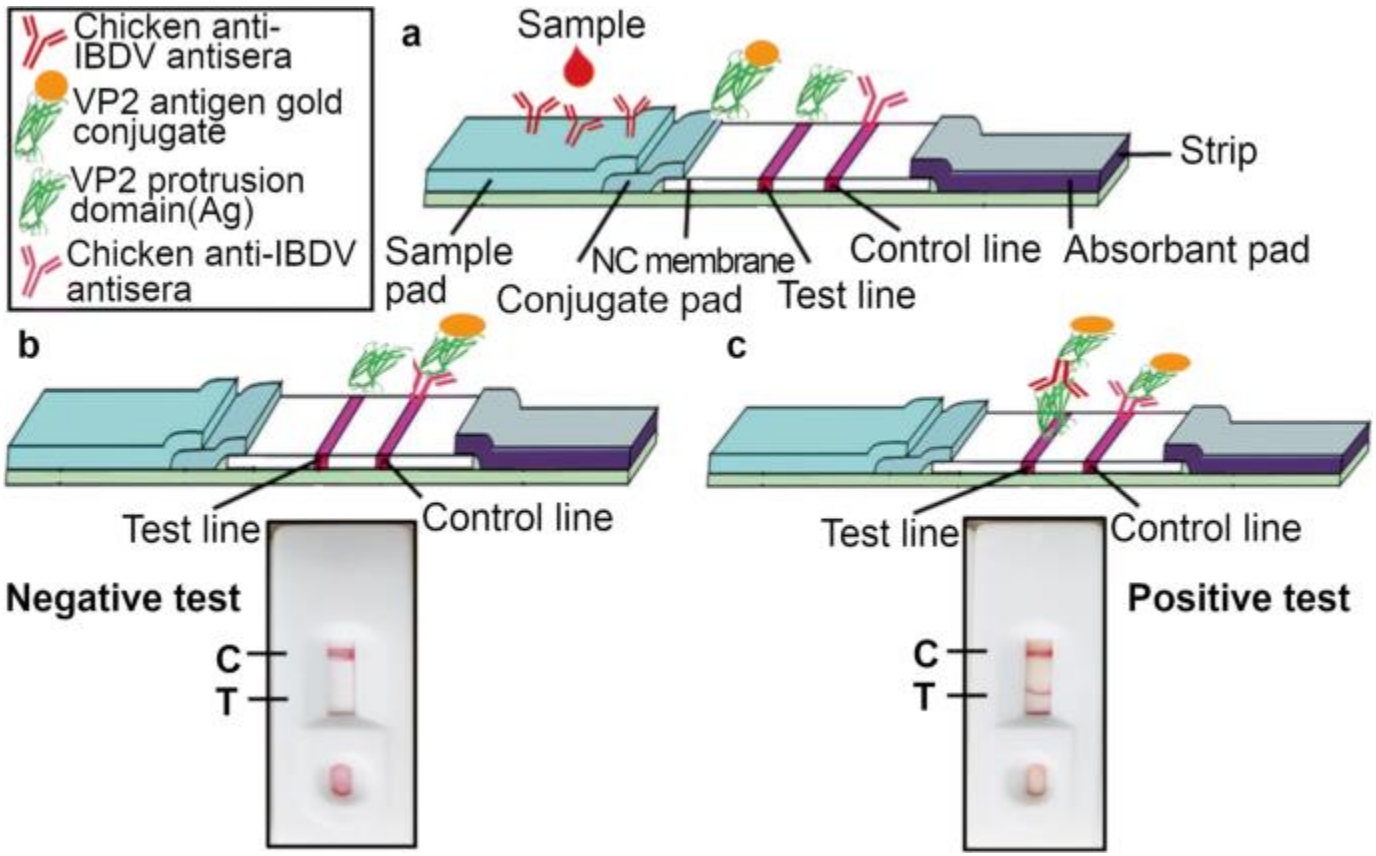
Real-time RT-PCR allows IBDV differentiation based upon time and number of samples that can be tested simultaneously. The RT-PCR SYBR green technology is robust and may serve as a useful tool with high capacity for diagnostics as well as in viral pathogenesis studies..

Loop-mediated isothermal amplification (LAMP)

LAMP compared to RT-PCR is 10 times more sensitive, rapid and specific assay and is the method of choice for field virus detection with no cross-reactivity. The test is specific as 2–3 pairs of primers are used to amplify the more conserved-targeted regions.

5. One-step strip test

One-step strip tests based on colloidal gold labeled monoclonal antibodies were developed to detect the IBDV antigen. The test was found to be highly sensitive, specific and rapid for diagnosis of the infection in the field when compared with AGID test.



IBD - PREVENTION AND CONTROL

- *Birnavirus* is highly stable in nature, practically impossible to eradicate the source of IBDV infection once the rearing site got infected.

- Cleaning and disinfecting the sheds before chick's arrival, **all-in all-out system** and **disinfection with formaldehyde** and **iodophors** have shown effective improvement.

- Along with the general practice of treatment with 3 types of viral disinfectants, the **combination of glutaraldehyde and QAC, phenolic compound and triple salt is the best way of disinfection treatment**.

- Maintaining proper **biosecurity measures** and chicks from a **good hatchery source** will also reduce IBDV infection.

- Despite the hygienic measures, **vaccination** is unavoidable to prevent IBDV infection in poultry farm.

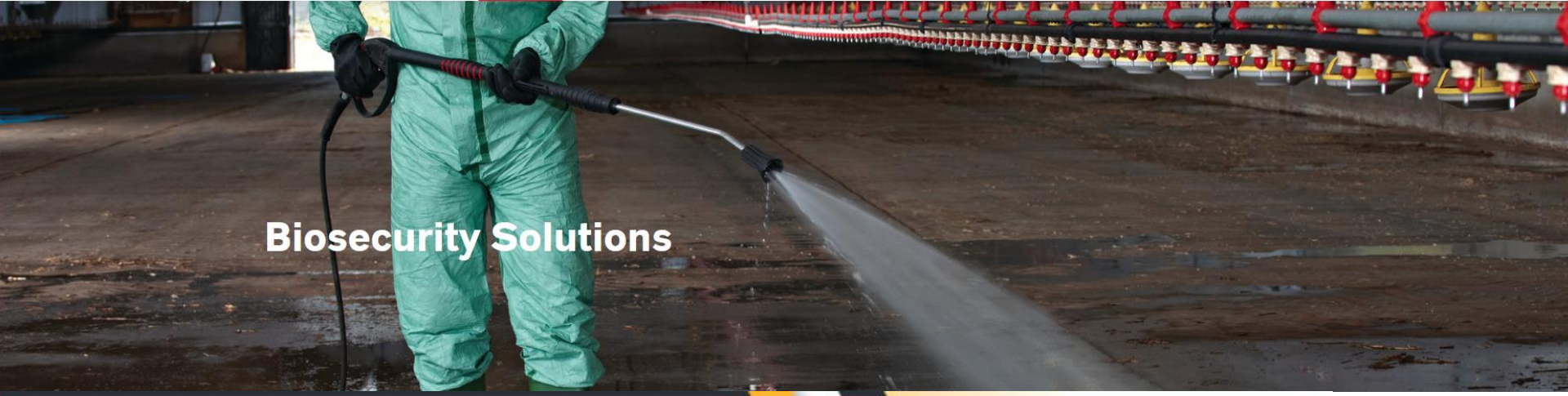
Disinfection

The infectious bursal disease was inactivated by **heating at 56 and 80 C for at least 300 and 120 minutes**, respectively.

Sodium hypochlorite 0.5% was able to inactivate the virus with 60 minutes contact time, while

Virkon with the concentration of **1:200 and 1:400** was able to inactivate the virus for 30, 60, 120, and 300 minutes exposure. This study showed that due to its resistance, proper use disinfection process and physical treatment are required to inactivate the virus.

Flame gun - Incineration



Disinfectant

Virkon™ S

Disinfectant and Virucide

SAMPLE LABEL
FOR REVIEW PURPOSES ONLY

LANXESS

For use in cleaning and disinfecting industrial, animal and agricultural facilities

Powder Form

Effective against Viruses*, Bacteria, and Fungi

ACTIVE INGREDIENTS	
Potassium peroxymonosulfate	21.41%
Sodium chloride	1.50%
OTHER INGREDIENTS	77.09%
Total	100.00%

Equivalent to 9.75% Available Chlorine

KEEP OUT OF REACH OF CHILDREN

DANGER/ PELIGRO

See Inside Booklet for Additional Precautions

EPA REG NO 39967-137
EPA EST. NO. 57787-MI-003

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15 – 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15–20 minutes. Call a poison control center or doctor for treatment advice.
IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a Poison Control Center or doctor or going for treatment.
For 24-hour emergency information on this product, call 866-673-6350.
NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

0 83014 40290 9

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Net Contents:
10LB (4.53kg)

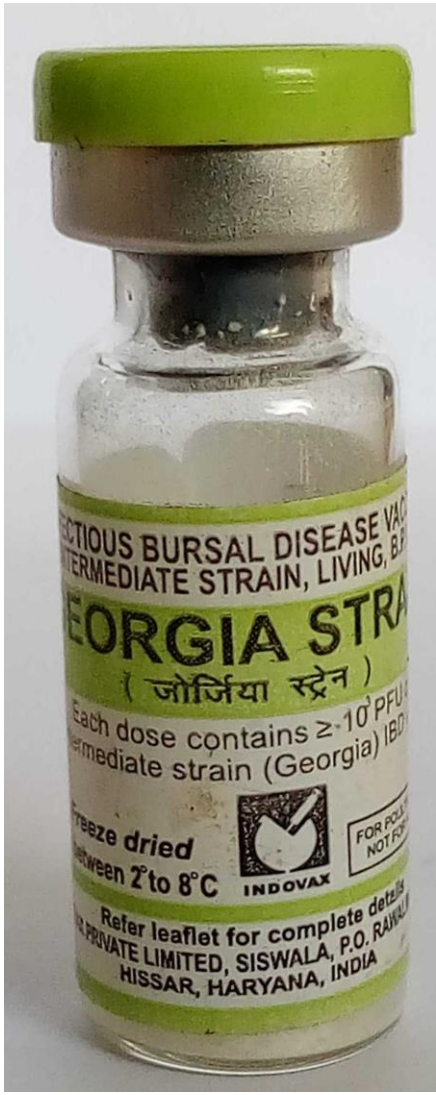
RSL_31/VirkS/10lb/USA/19.03.17/G

Provides effective disinfection against AI at a cost-effective 1:600 in-use dilution rate in 10 minutes!

Provides effective disinfection against AI at a 1:200 in-use dilution rate, at 5°C in 1 minute!

Vaccines and vaccination for the effective control of Gumboro disease

		Broilers
Broiler Layer/ breeders	Infectious bursal disease Vaccine (IBDV-Georgia strain)	2-3 weeks (Primary Dose) **Layers** 16 weeks (Booster Dose)
Commercial layers/ Breeders	Marek's disease	Day 1
	Ranikhet disease	1-7 days 3-4 weeks 8 weeks 16-18 weeks
	Infectious bursal disease	40th week (Booster Dose)

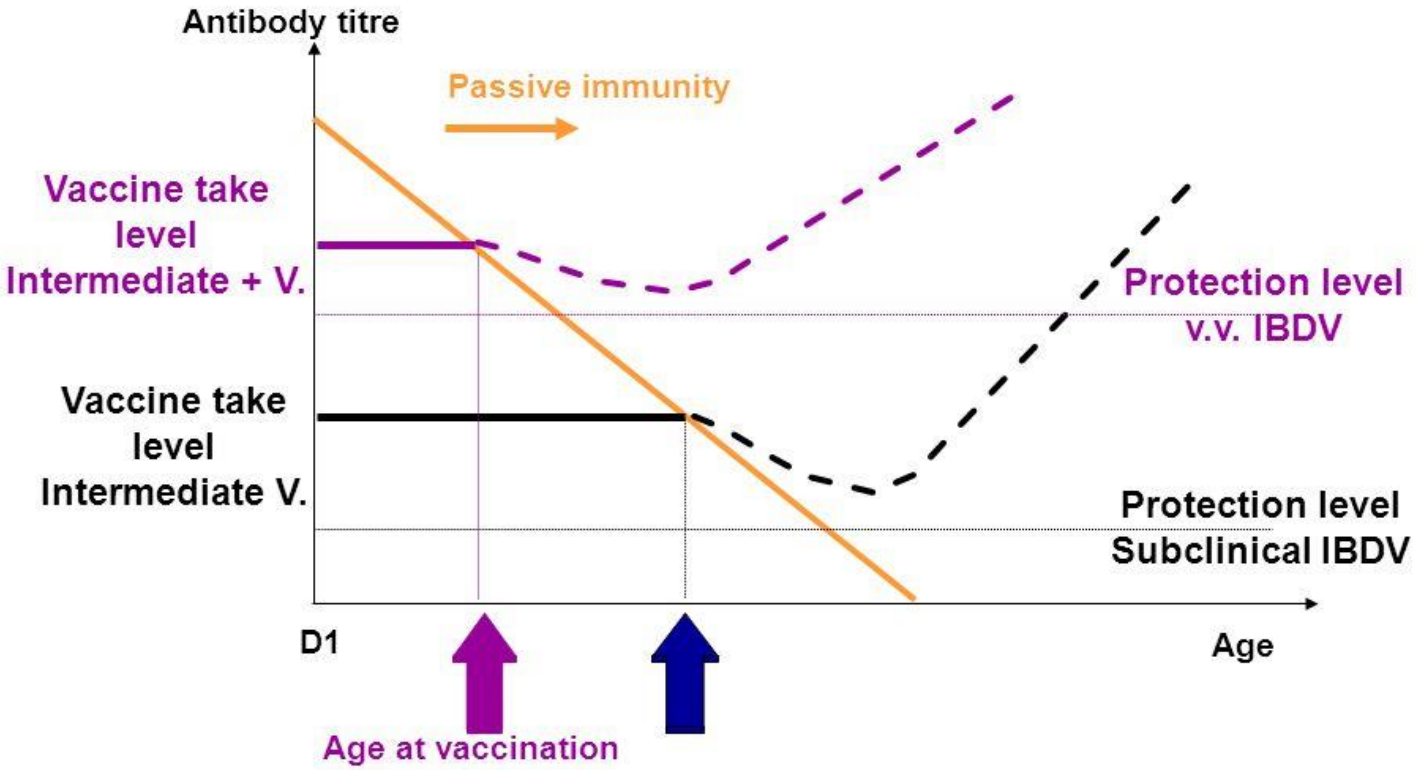


Vaccines and vaccination for the effective control of Gumboro disease

- Exposure can be reduced by thorough cleaning and disinfection of poultry houses.
- Killed virus vaccines are used in breeders.
- Attenuated live virus vaccines of chicken embryo origin are administered by eye instillation or drinking water to chicks during the first 1 - 2 weeks of age, but vaccination may not be effective if passively acquired immunity is high.

IBD: The concept of constant protection

AGE AT VACCINATION VARIES ACCORDING TO VACCINE TYPE and EPIDEMIOLOGICAL SITUATION



THANKS

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