

16<sup>th</sup> Poultry

**Kn**  **wledge**  
**Day** 26 NOVEMBER

**SHAPING  
THE FUTURE**  
OF INDIAN POULTRY SECTOR

# Strategies to control Inclusion Body Hepatitis (IBH) an emerging health problem in broilers

**M.R. Reddy**

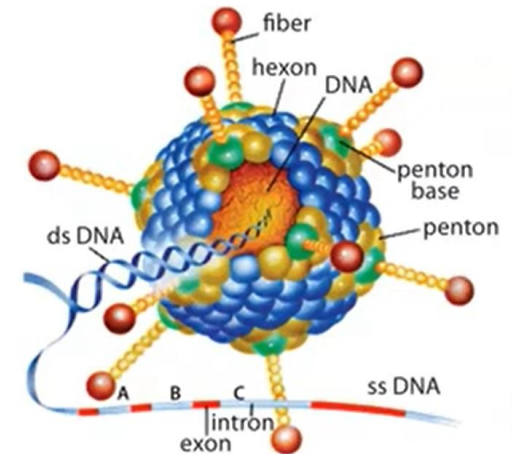
**ICAR-Directorate of Poultry Research  
Hyderabad-500030, TG, India**



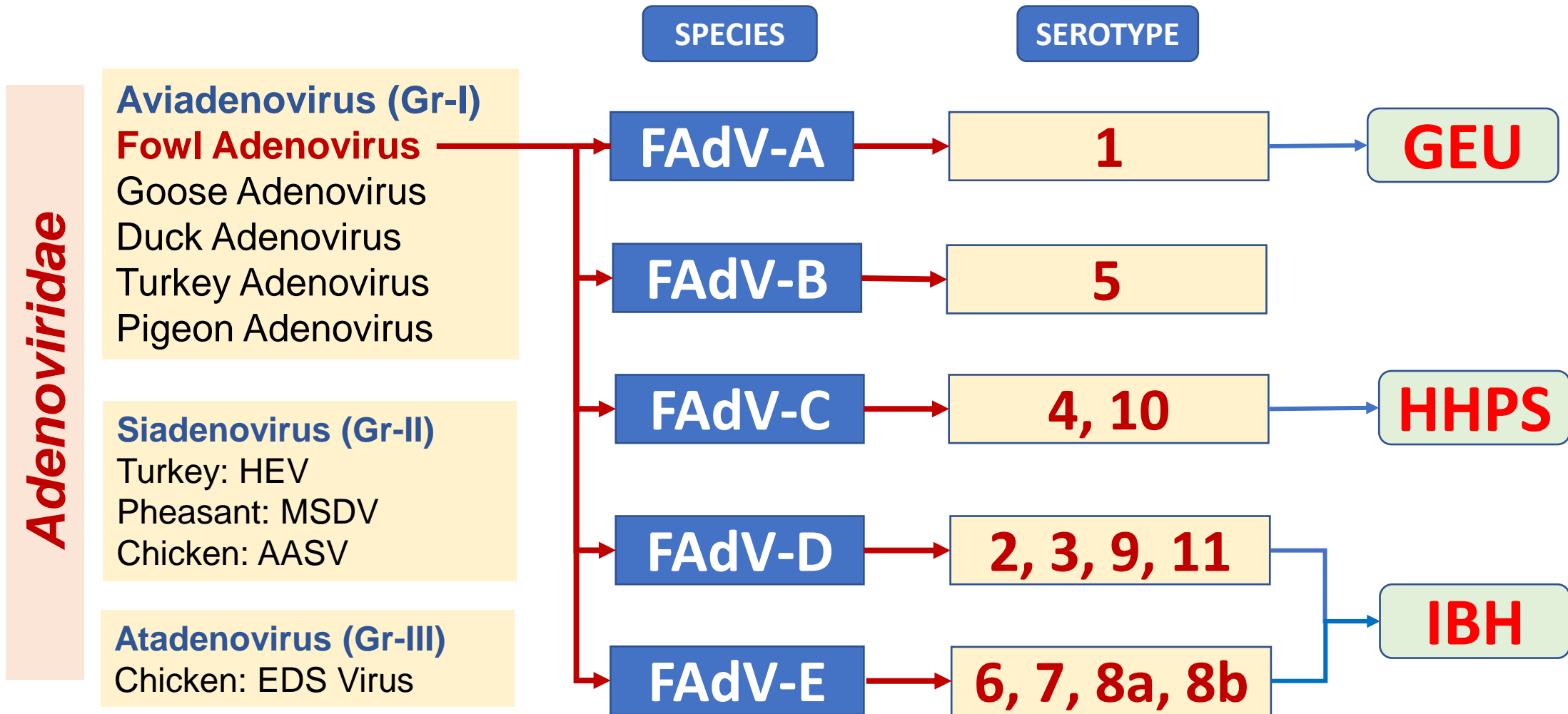
# Outline

**Inclusion body hepatitis (IBH)** is an acute disease of young broiler chickens caused by several serotypes of **fowl adenovirus (FAdV)**, characterized by **intranuclear inclusion bodies** in hepatic cells.

- FAdV – serotypes
- Clinical disease
- Risk Factors
- Diagnosis of IBH
- Outbreak Handling
- Prevention strategies
- Monitoring – Disease/vaccination

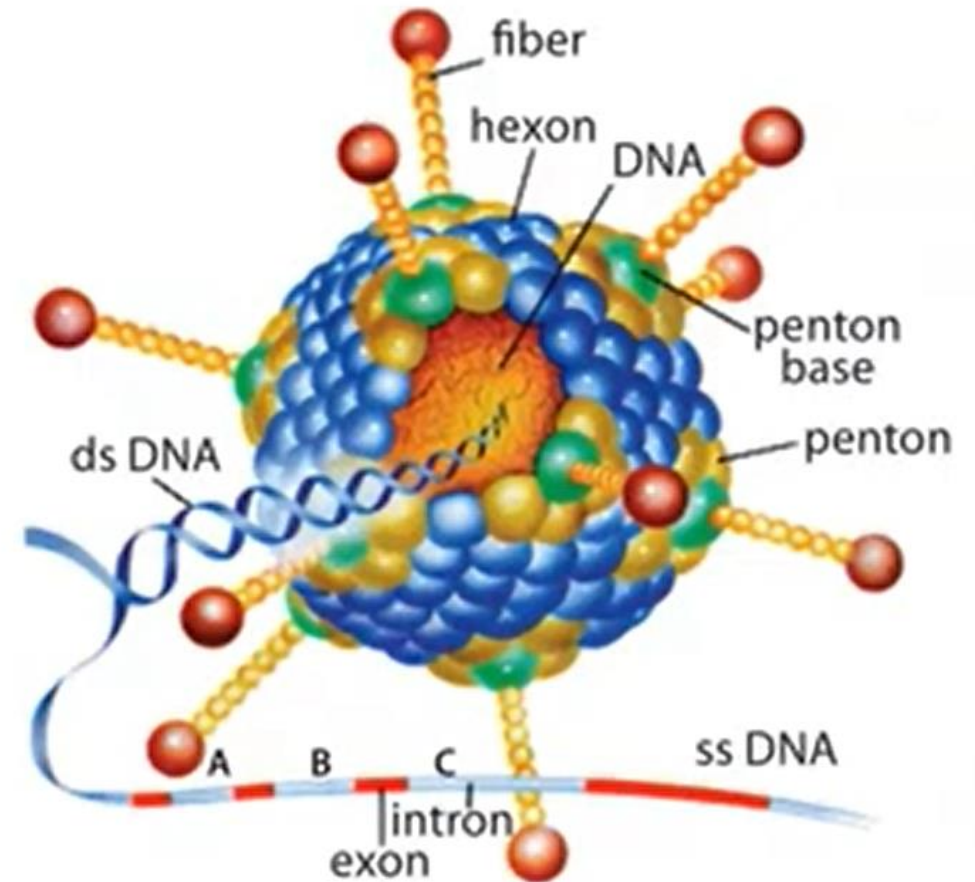


# Fowl Adenovirus - Serotypes



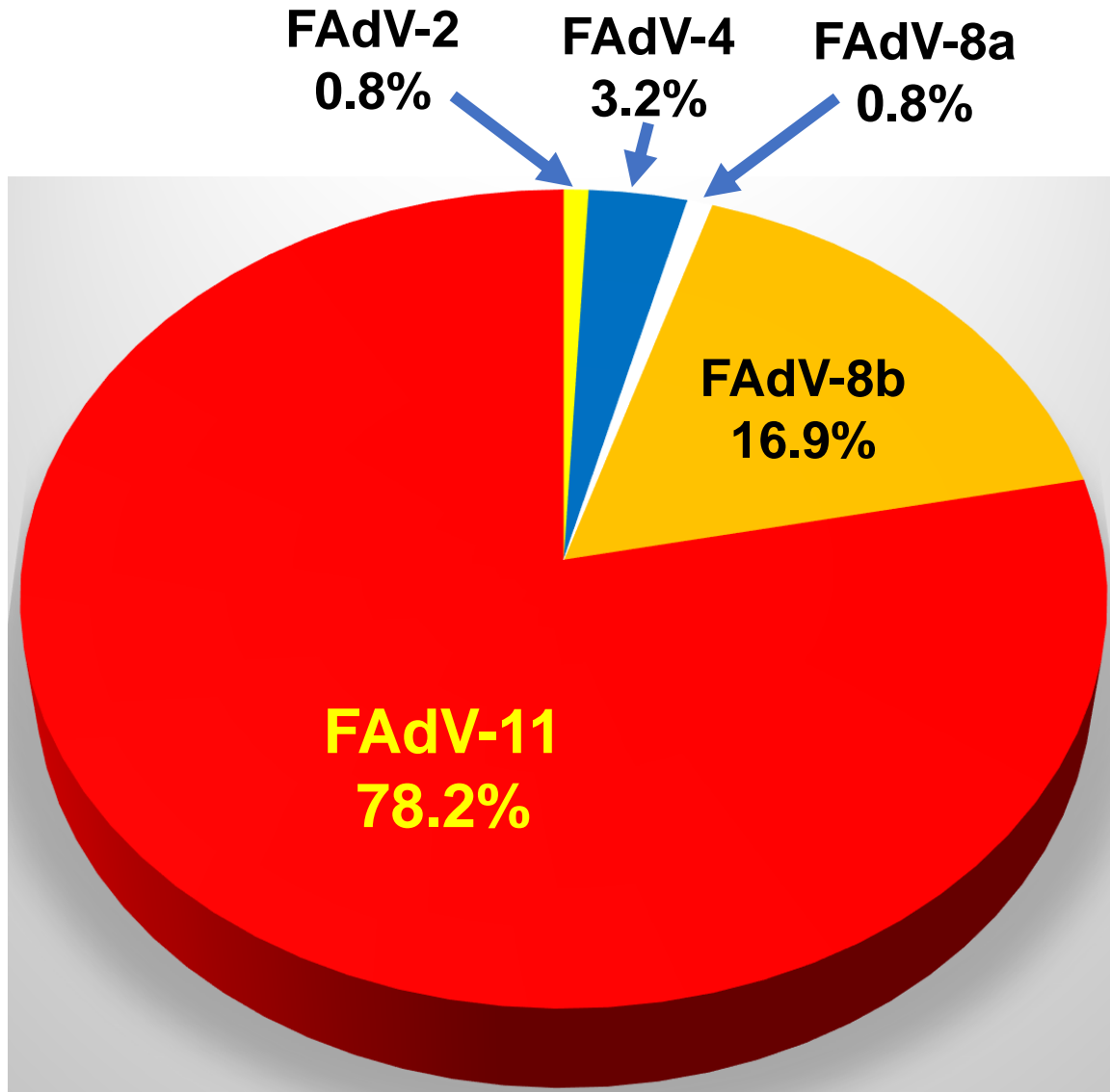
# Unique Features of FAdV

- A medium sized (75-90nm), **Naked** (Non-enveloped) virus
- Virus appears like a space vehicle
- dsDNA Genome (43kb)
- **Withstand pH range of 3 to 9**
- **Resistant to sunlight & Heat 70°C/30min**
- Resistant to **common disinfectants**
- Can remain infective in the environment for long periods
- Replicate in nucleus and release by cell **lysis - death**
- Mixed infection – **recombination**



**A tough outer protein coat (capsid) is more resistant to degradation  
Core genetic material, made of double-stranded DNA, is more stable**

# Prevalence of FAdV Serotypes Circulating in India



- Earlier outbreaks: Mainly due to FAdV-4
- Recent outbreaks: FAdV-8b and FAdV-11
- The decline of FAdV-4 may be due to application of FAdV-4 vaccine
- Emergence of FAdV-8b & FAdV-11 indicate no cross protection by FAdV-4 vaccines

# Epidemiology

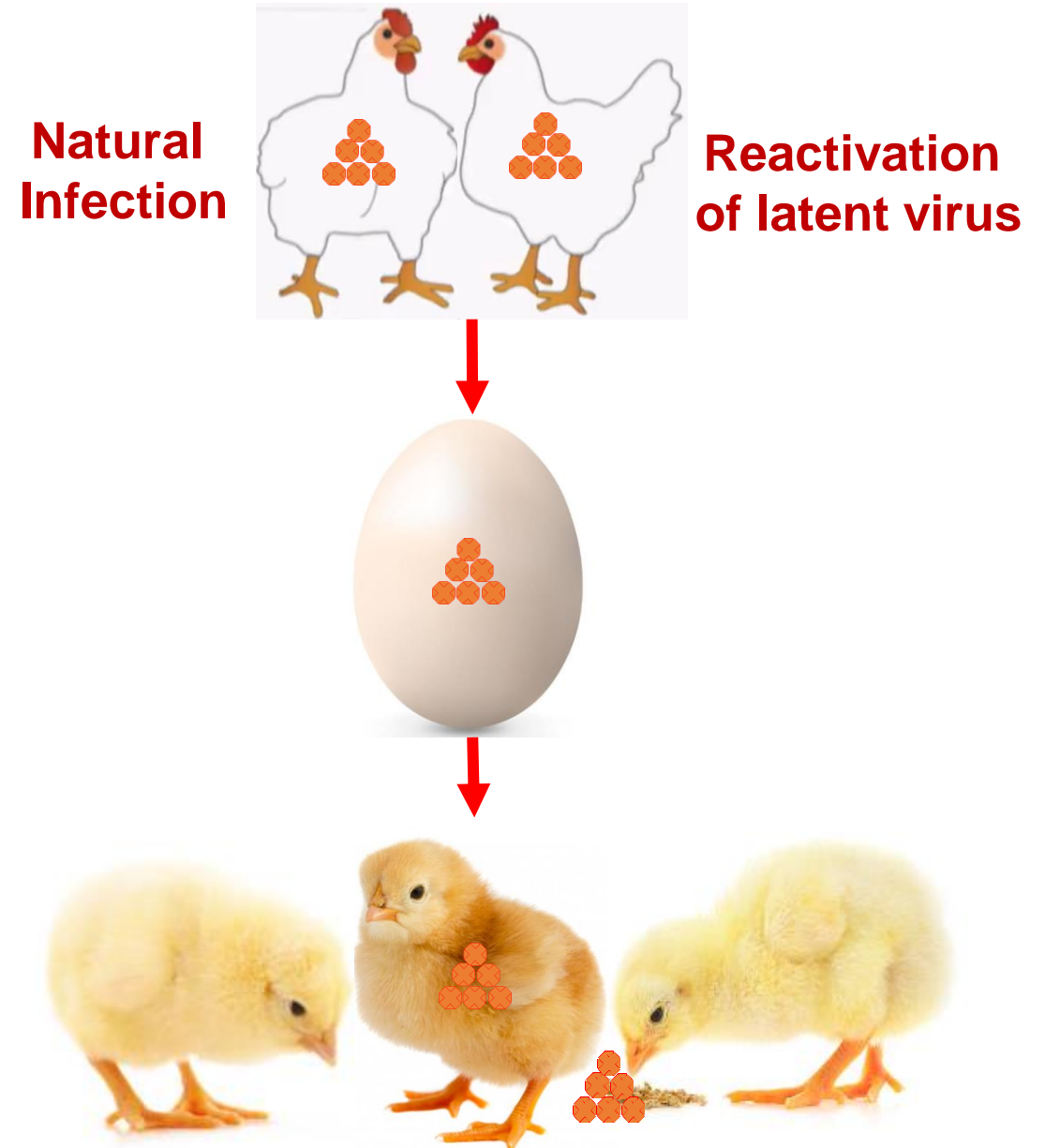
- FAdVs are widespread in chickens
- Birds can be infected with more than one serotype
- Broilers are more susceptible with higher mortality due to:
  - Severe metabolic imbalance
  - Heavy destruction of liver pancreas
- Protection is primarily serotype specific, no cross protection between FAdV species
- Other Species affected include Turkeys, Pigeons, Quails, Psittacines, ostriches, guinea fowl, duck, wild birds



# Disease Spread

## Vertical Transmission

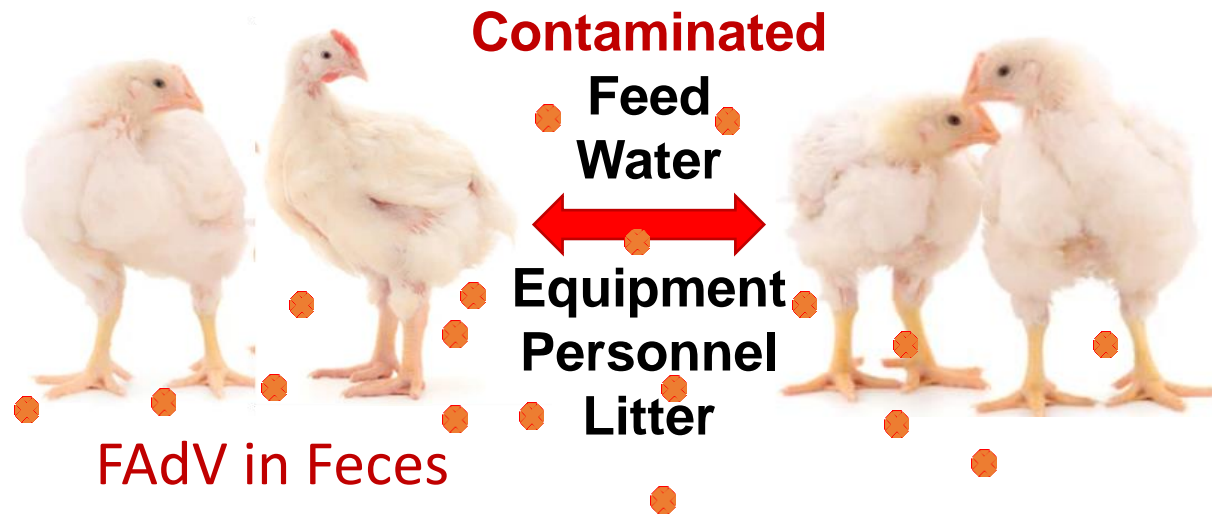
- Breeders are not seroconverted before lay
- Infection during lay – Virus shedding for 4-8wks
- Reactivation of latent virus
- Outbreaks due to VT tend to occur early in the cycle 3-20 days of age
- Very important to achieve seroconversion before lay
- **Egg production stress, increased levels of sex hormones at peak egg production causes reactivation**





# Disease Spread

## Horizontal Transmission Fecal-Oral route



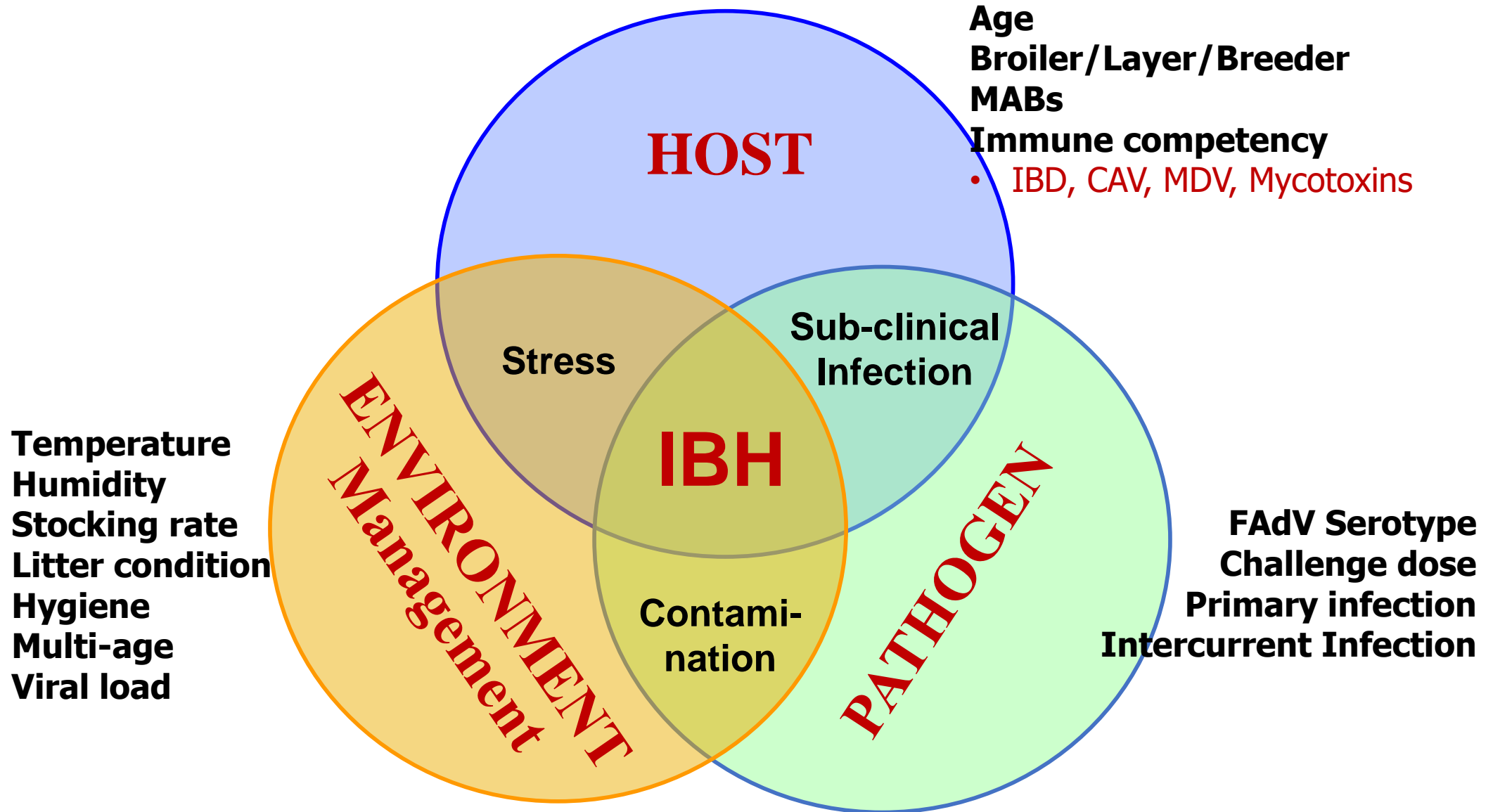
Chickens infected from the virus present in the broiler farm

Outbreaks due to HT tend to occur later in the cycle after 15-20 days

Recurrent problem in poorly cleaned and disinfected Farms

Commonly associated with immunosuppression

# IBH: Host-Pathogen-Environment Interaction



# IBH is a Primary or Secondary Disease?

Fowl Adenoviruses are able to cause IBH as a primary disease in broilers without involvement of predisposing factors or co-infections with IBDV, CAV, MDV etc

Predisposing factors/co-infections

IBH



IBD, CAV  
MD, REO  
Stress, Toxins



**Increase the severity  
of clinical disease**

# Clinical syndromes

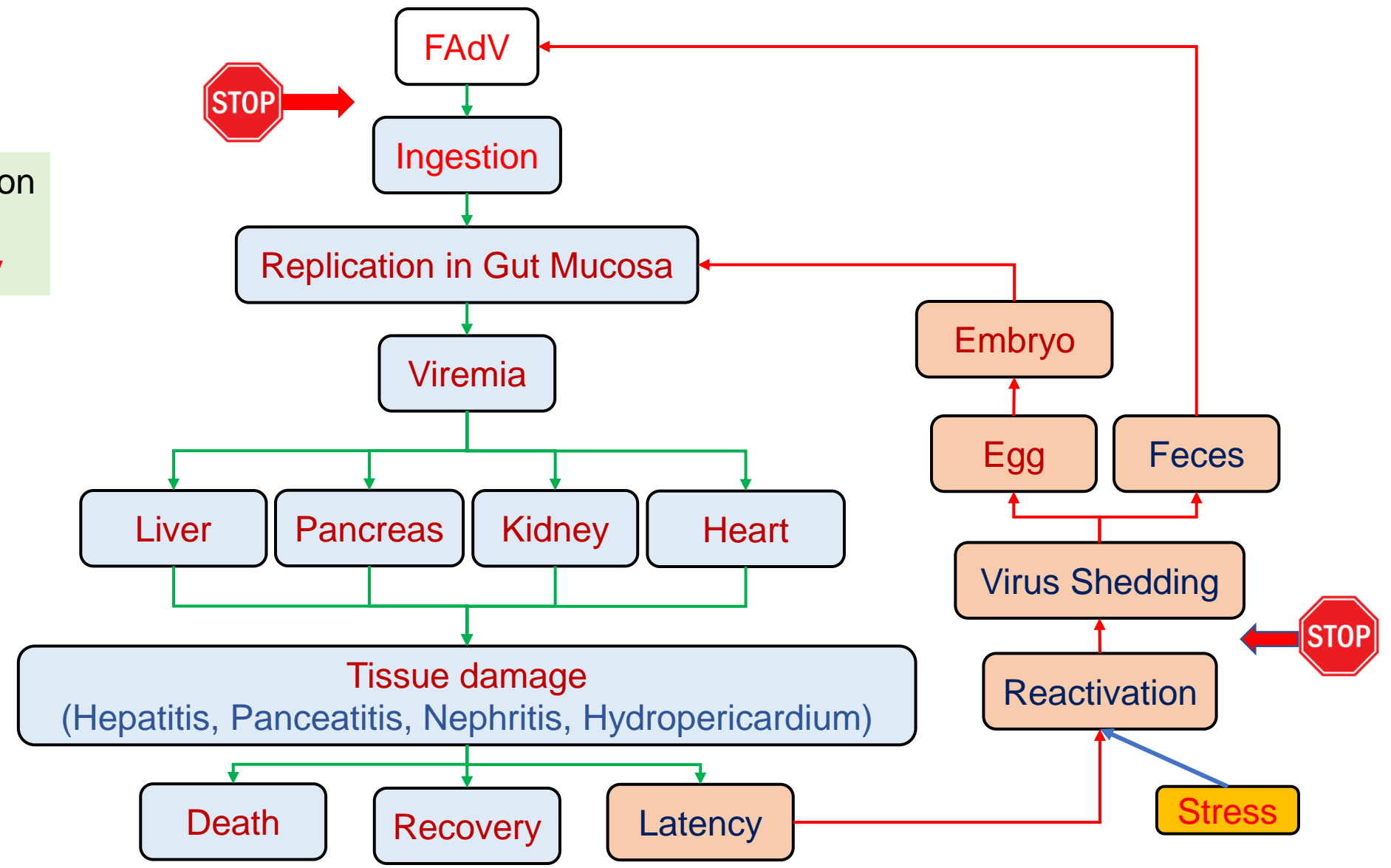
- **Inclusion body hepatitis (IBH)**
- **Hepatitis Hydropericardium Syndrome (HHS)**
- **Gizzard erosion and Ulceration (GEU)**

# Pathogenesis

Loss of integrity & function of target organs:  
liver, pancreas, kidney

## Biomarkers

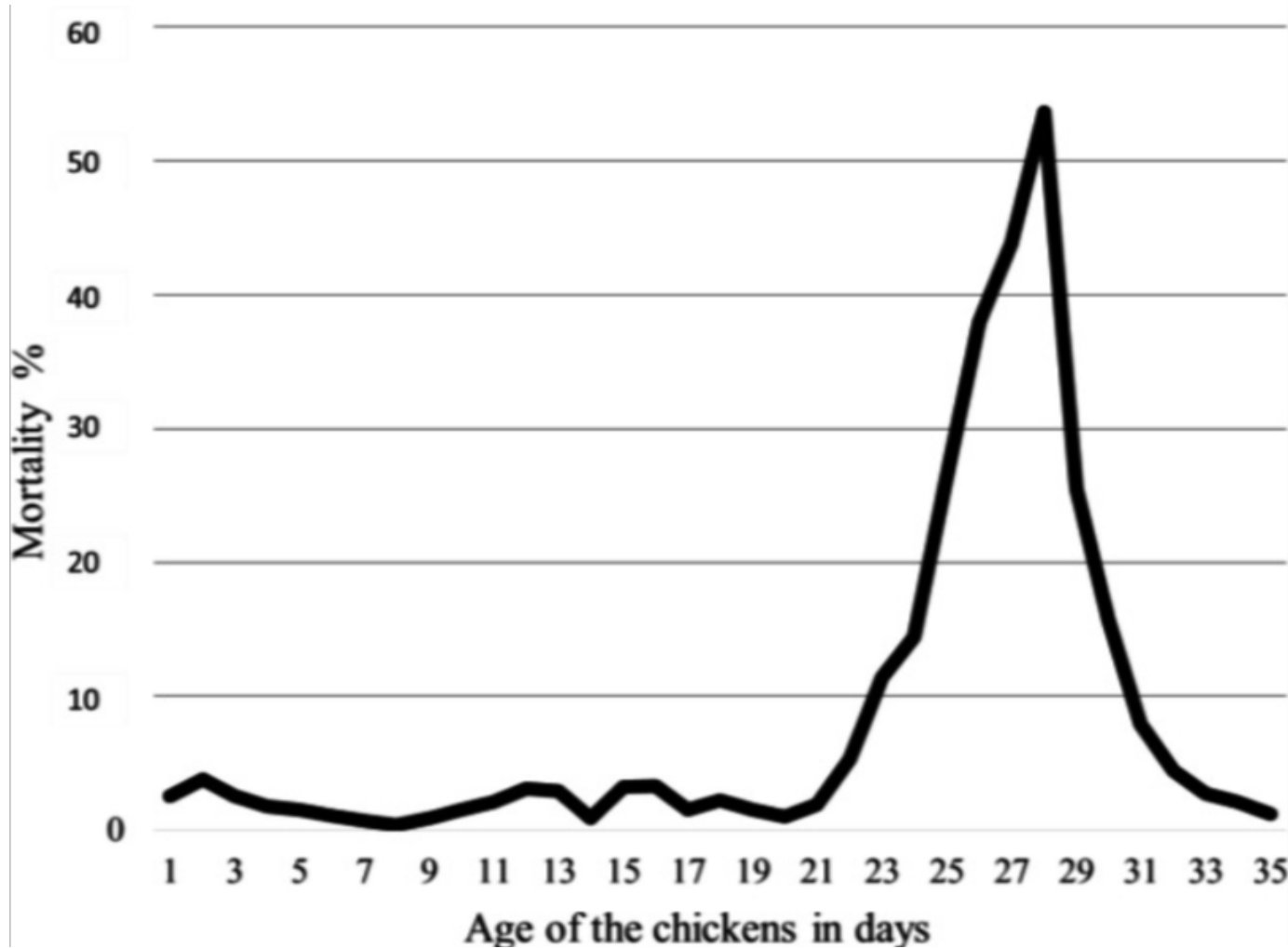
- AST
- GLDH
- Bile acids
- Total protein
- Albumin
- Uric acid
- Lipase



# Clinical Signs

- IBH most commonly seen in Broilers 2-5 weeks of age
- Occasionally reported in younger and older chickens and layers and Breeders
- Incubation period is very short 24-48 hrs
- Sudden onset of mortality 1-10%, occasionally exceeding 30%
- The sick birds show lethargy, huddling, ruffled feathers, depression, inappetence and adopt a crouching position
- HHS is more severe and cause greater morbidity and mortality (20-80%).
- Breeder mortality, drop in production and hatchability

# Spiking mortality pattern in IBH infected chicken flocks



**Metabolic Acidosis  
Hypoglycemia  
Hypocalcemia**

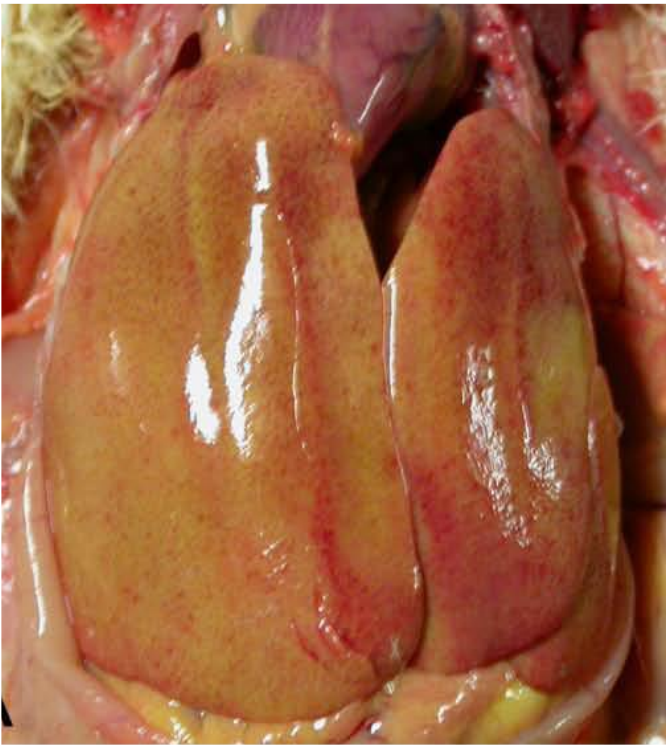


**Increased severity  
Spiking mortality**



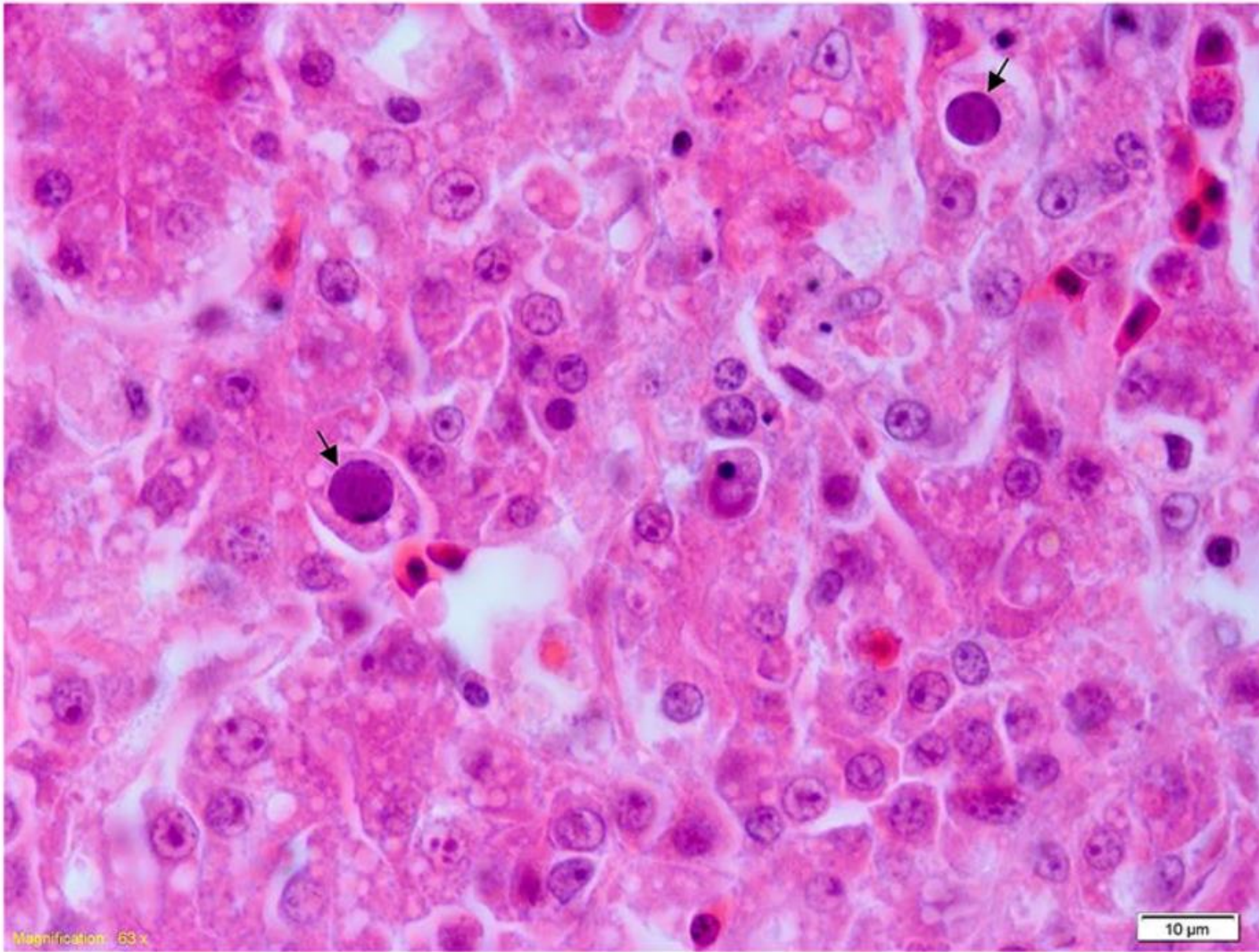
# Gross and Microscopic lesions

- Pale, friable, swollen livers with necrotic foci and multiple subcapsular petechial hemorrhages
- Pale and swollen kidneys
- Swelling with multifocal necrosis in pancreas
- Fluid accumulation in the pericardial sac
- Atrophy of bursa and thymus, aplastic bone marrow
- Large, basophilic, Intranuclear inclusion bodies in degenerating and necrotic hepatic cells of liver and acinar cells of pancreas

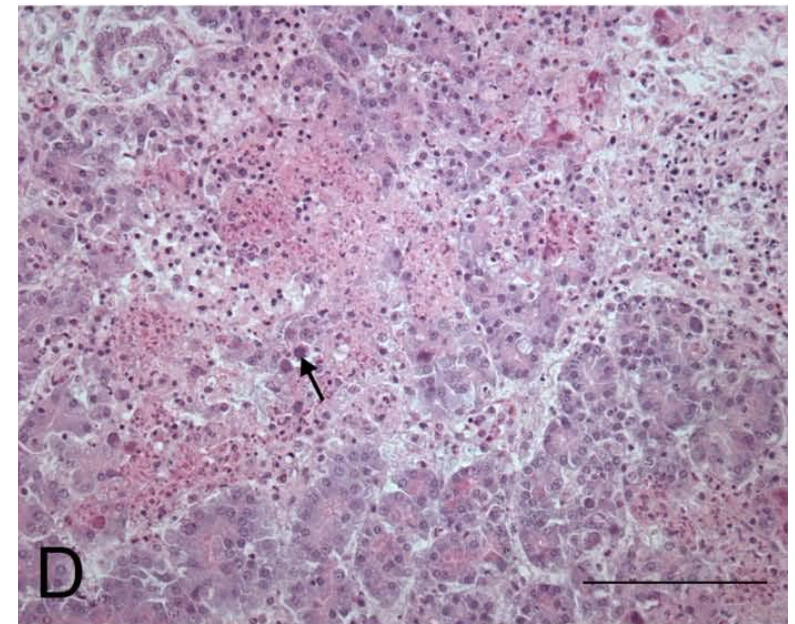
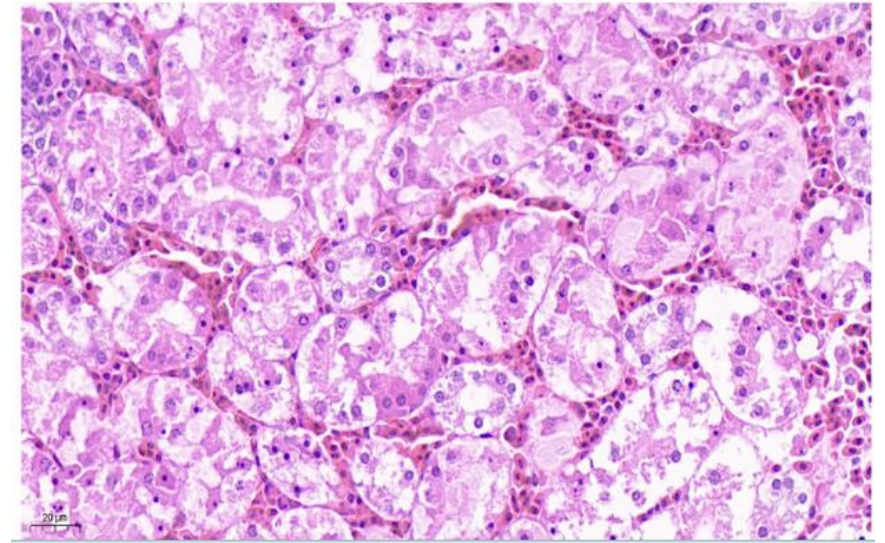


Samantha, 2009



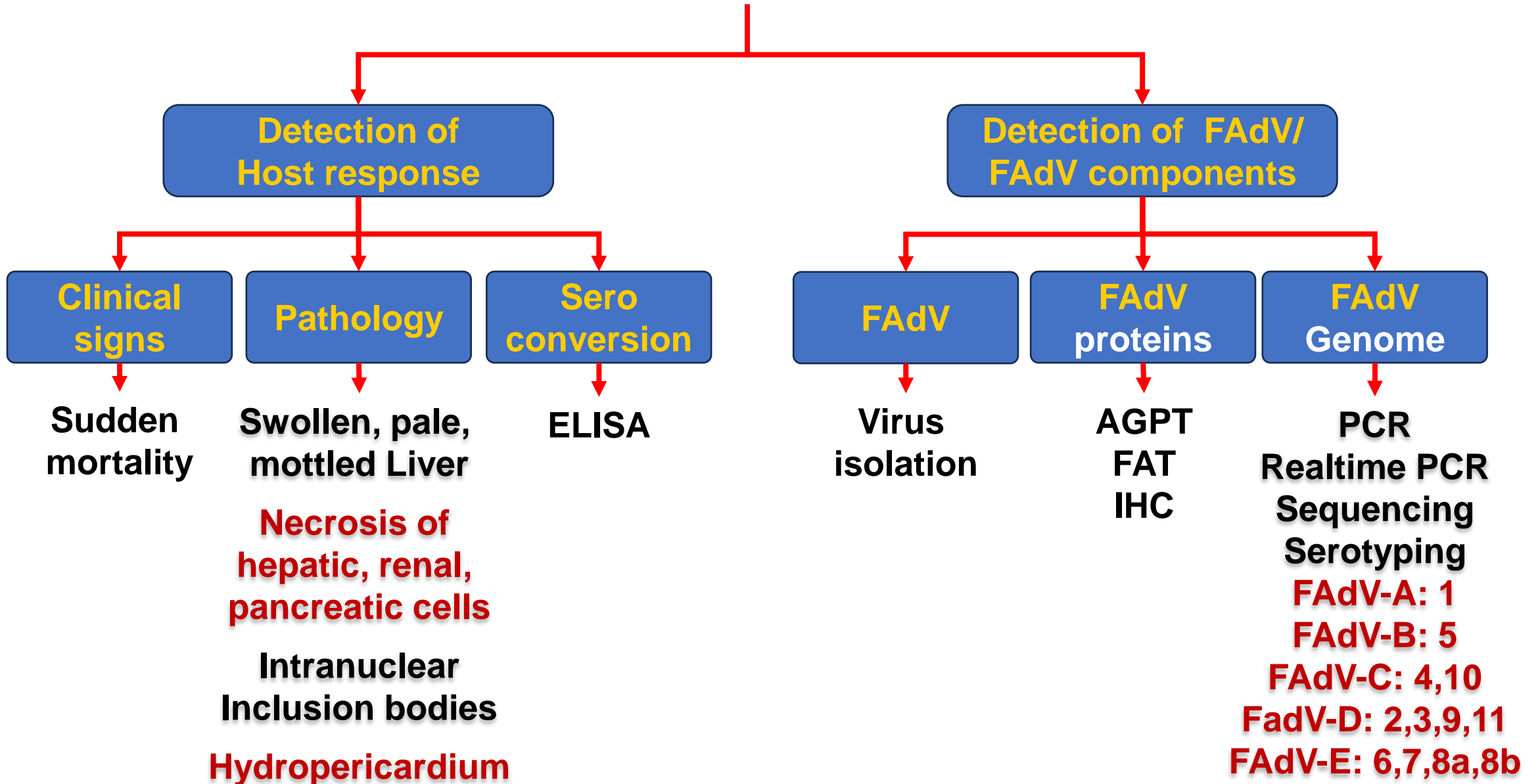


Basophilic intranuclear inclusion bodies completely filling the enlarged nuclei of hepatocytes



Basophilic intranuclear inclusion bodies in pancreatic acinar cells

# IBH Diagnosis



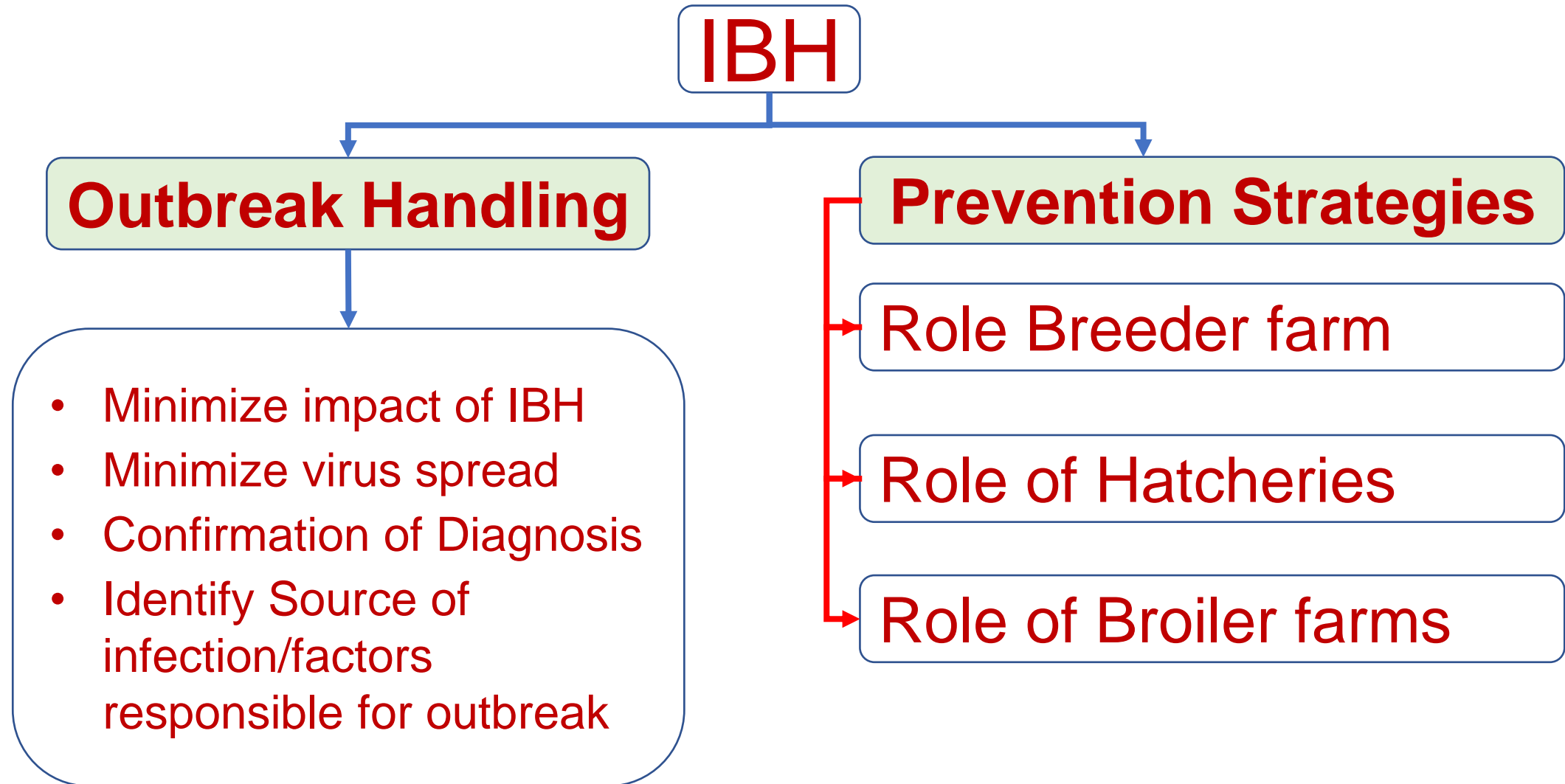


# Disease Prevention and Outbreak Handling

## Major points to be considered

- Naked virus – resistant to heat and common disinfectant – survive for prolonged periods
- Cause severe disease in young broilers
- Vertical transmission of virus
- Serotypes circulating in the poultry (FAdV-11,-8b,-4)
- Latency and Reactivation of FAdVs
- Risk factors
  - Immunosuppressive diseases – IBD, CAV, MD etc
  - Management and environmental stress
  - Amount of virus in the environment

# Disease Prevention and Outbreak Handling



# Handling of IBH Outbreak

- **No antiviral treatment**
- **Minimize the impact of IBH**
- **Damage to the liver & pancreas results in hypoglycemic conditions.**
- **Restoring liver and pancreatic functions** to normal levels which in turn **improves glucose metabolism** and **limits the mortality** in the IBH affected flocks.
  - Soda bicarb (125g) + Sugar (400g) in 575 L of drinking water
  - Treat secondary disease
  - Multivitamin supplements
  - Electrolyte supplements
- **Ensure GMP**
- **Confirm Diagnosis and identify Source of infection/factors responsible for outbreak**
- **Minimize virus spread**
  - **Disposal of dead/sick birds**
  - **Disposal of litter**
  - **Cleaning & disinfection**
  - **Terminal disinfection**
  - **Down time**
- **End of the flock serology**



# Prevention Strategies – Breeder Level

## Vaccination Breeder flocks

- To prevent vertical transmission
- To provide passive immunity (MAbs)

## Vaccine serotypes

- FAdV-4
- FAdV-8b
- FAdV-11

## Vaccination Schedule

- 12<sup>th</sup> week
- 18<sup>th</sup> week
- 40<sup>th</sup> week (mid lay)

## Vaccination of breeders against immunosuppressive diseases

- CAV
- IBD

Achieving good seroconversion before lay is critical

Prevent reactivation of latent virus

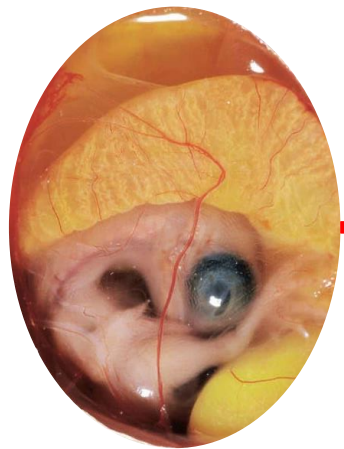
- Prevent stress

## Biosecurity

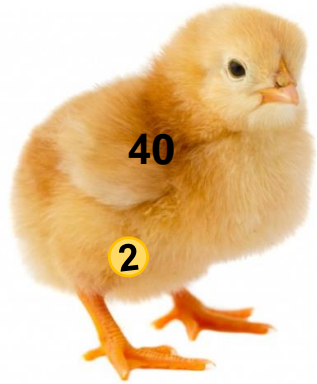
- Cleaning and disinfection
- Down time

# Prevention Strategies – Hatchery Level

- Optimum incubation conditions
- Good chick quality
- Good yolk absorption and utilization

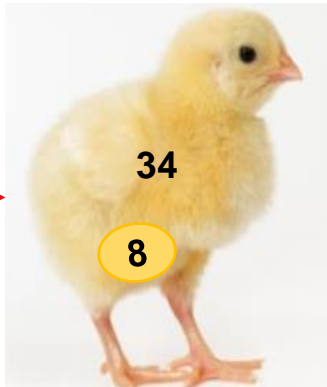


60 gram Egg



**42 grams**

Strong immune system  
Ability to fight infection  
Improved gut health



**42 grams**

Weak immune system  
Susceptible to infections

Mixing of eggs from multiple breeder farms

- Mixing of several serotypes of FAdV
- Level of Maternal antibody
- Chick uniformity

# Prevention Strategies – broiler farm

- Proper cleaning and disinfection
  - Aldehydes and lime
- Vaccination of broilers
  - 0-10 days
  - FadV-4, 8b, 11
- Avoid Management/environmental stressors
  - Temperature, feed, air, litter, water, sanitation
  - Dead bird disposal, Manure handling and storage
  - Pest control
- Control of immunosuppressive viruses with robust vaccination program
  - IBDV: breeder, hatchery, Farm
  - CAV: Breeder
  - MD: hatchery
- End of the Flock Serology
  - IBH, IBD, CAV

# Cleaning and disinfection

## Cleaning

- Remove litter and move away from the farm
- Wash with water to remove organic matter and dry

## Disinfection

- FAdVs are highly sensitive to Calcium Hydroxide (Lime) and Glutaraldehyde

Name	Dilution	Application
Glutaraldehyde (25%)	1:200 <b>pH: 7.1</b>	Spray on the floor, walls, ceiling, appliances and the outside slope for loading/unloading chickens.
Calcium Hydroxide (Slaked lime)	1:10 <b>pH:12.3</b>	Spray on the floor and walls inside the poultry houses and the outside slope for loading/ unloading chickens.

# Disease and vaccination monitoring

- Vaccination monitoring of Breeders
  - *Good seroconversion of breeders before lay stops vertical transmission*
  - *Weak seroconversion pre-lay – field infection - vertical transmission*
- Monitoring of MAB in day old chicks
- Vaccination monitoring in broilers
- Disease monitoring in breeders and broilers
  - *Genotyping of FAdVs from outbreaks*
  - *Updating vaccines with new genotypes, if any*

# Summary

- FAdVs are ubiquitous in poultry farms
- It is a tough virus and resistant to commonly used disinfectants
- Breeder vaccination and achieving good seroconversion prevent vertical transmission and provide MAB to progeny
- Broiler vaccination
- Prevention of immunosuppressive diseases – IBD, CAV, MD
- Through cleaning and disinfection
- Good management practices to avoid stress and spread of virus
- Monitoring of disease and vaccination in breeders and broilers

**IBH is Complex Disease, there is no “*Silver Bullet*”**

***“Doing the right things at breeder farm, hatchery  
and broiler farm is crucial to control IBH”***





*Thank you for your attention*

