Egg Production and Egg Quality Problems

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Egg Production and Egg Quality

- Breeders companies give guidelines regarding sexual maturity (17 to 18 weeks), peak of lay (90% at 32 weeks), end of production at 80 weeks of age for one cycle. Second laying cycles at 105 weeks of age

- Management: ventilation, lighting, feeding, nutrition especially protein, Ca and P, water quality, litter quality, cages, rodent and fly control, dead bird disposal, manure disposal

Egg Production and Egg Quality

- Biosecurity
- Cleaning and disinfection
- Vaccinations: depends on the region and disease problems. Types and dose of vaccines, routes of vaccination, etc.
- Standard vaccination program: MDV, IBDV, IBV, NDV, ILT, Pox, AE, CAV, S. Enteritidis
- Flock: Antibiotic free, organic?

Causes of Egg Production and/or Egg Quality Problems – Infectious

- Viruses: IBV, NDV, AE, EDS 76, AI, ILT, APMV-3, APMV-2, Pox, MDV/LL/REV, Hepatitis E virus, etc.
- Bacteria, MG, MS, Salmonella (SE and others), Infectious coryza, P. multocida, ORT, E. coli, Spirochetes, etc.
- Histomonas, coccidia, round worms, mites, etc.

Causes of Egg Production and Egg Quality Problems – Non infectious

- Nutrition: lack of Ca, P, vitamin D3, Ca:P ratio, water, essential amino acids, vitamins, etc.
- Toxicosis: mycotoxins (T2, Aflatoxins, Ochratoxins), ammonia, minerals, Nicarbazin, Iodine, vitamins, etc.
- Light, temperature, vaccines, stray voltage, etc.
**Hepatitis E virus Infection**

- Has been called by various names
  - Hepatitis splenomegalic syndrome
  - Weeping liver disease
  - Necrotic Hemorrhagic Hepatitis-splenomegalic syndrome
  - Chronic Fulminating Cholangiohepatitis
  - Hepatitis-Liver Hemorrhage Syndrome
  - Necrotic haemorrhagic hepatomegalic hepatitis
  - Necrohemorrhagic hepatitis
  - Big liver and spleen disease - Australia

**Hepatitis-Splenomegalic syndrome**

- 1993 – from California (Dr. Read *et al.*)
  - Incidence over eight years on two farms
  - In 40–60 week-old White Leghorns
  - Increased mortality (0.1 – 0.3 % / week)
  - Decreased egg production (12 – 20 %)
  - Bile: 30–40 nm virus particles by EM
  - Influence of force-molt
- 1995 – Shivaprasad and Woolcock
  - 52-56 week-old broiler breeders, decreased egg production and increased mortality
**Hepatitis-Splenomegaly syndrome**

- **Gross Pathology**
  - Sudden death, pale combs
  - Clotted blood or red watery fluid in abdominal cavity
  - Liver pale, enlarged, friable, mottled tan/red, subcapsular hemorrhages or hemotoma’s, ruptures, clotted blood
  - Spleen, enlarged and pale
  - Regressing ovary and oviduct
Hepatitis-Splenomegaly syndrome

- Histopathology
  - Liver: periportal and vascular inflammation (phlebitis)
    - amyloid in the interstitium and vessels
    - necrosis, hemorrhage, fibrin exudation
    - granulomas, biliary hyperplasia
  - Spleen: lymphoid depletion, increase in Mononuclear Phagocyte System cells
    - amyloid in vessels and interstitium

Hepatitis E virus in humans

- Causative agent of Hepatitis E
- 20% mortality in pregnant women
- SS RNA virus with out an envelope
- 30 – 35 nm in diameter
- been isolated from swine and rodents
- serological evidence in other mammals
Big Liver and Spleen Disease
- Recognized in Australia in 1980’s
- Disease of broiler breeders and less commonly laying-type chickens
  - decreased egg production and increased mortality
  - enlarged liver with subcapsular hemorrhages, enlarged pale spleen
  - lymphocytic hepatitis and splenitis
  - evidence of virus in UK and US by serology
- Virus isolated by I/V inoculation of chicken egg embryos

Hepatitis-Splenomegaly Syndrome
- Drs. Haqshenas, Shivaprasad and Meng
  - bile inoculated in to chick embryos by I/V
  - harvested liver from hatched chicks
  - sequencing, RT-PCR, etc., in 2001
  - genomic organization and sequence homology related to hepatitis E virus
  - Serological survey in US by Huang et al. in 2002 – 71 % flocks positive.
- Billum et al. reproduced the disease in chickens in 2009

Big Liver and Spleen Disease
- Virus isolation in chick embryos, I/V route
- High titer of virus in liver of chicks
- Monoclonal ab to 16 kDa protein, sequence of genome fragments, Degenerate primer, RT-PCR
- Nucleotide sequence – hepatitis E virus
- BLSDV - 62 % sequence identity with helicase gene of human hepatitis E virus

Hepatitis-Splenomegaly Syndrome
- Part of HSS viral genome sequenced, compared with human HEV
  - 46-48 % identity with RdRp gene
  - 58-61 % identity with helicase gene
  - 44-46 % identity with ORF2 gene
- HSS virus, 80 % identity with BLSDV (helicase gene)
- HSS virus – most divergent Hepatitis E virus identified so far, named Avian HEV
Hepatitis-Splenomegaly syndrome

- Disease is widespread; Many countries in Europe, China, Korea
- Hepatitis E virus is also present in healthy chickens
- HSS virus: four genotypes recognized
  - Genotype 1 - Australia and Korea
  - Genotype 2 - USA and Spain
  - Genotype 3 – Europe and China
  - Genotype 4 – Taiwan and Hungary
- Great genetic diversity exists

Hepatitis E virus infection - Summary

- Hepatitis-splenomegaly syndrome and Big liver and spleen disease
- Causes clinical signs of decreased egg production and increased mortality
- Gross and histopathology
- Most divergent virus compared to mammalian virus
- Model to study hepatitis E virus infections