Diagnosis of Immunosuppressive Diseases of Commercial Chickens

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Recognizing Immunosuppression

Poor/harsh vaccination responses
Exaggerated morbidity/mortality
Early stress, later problems
  ◦ Runting stunting syndrome
Early exposure to immunosuppressive diseases
  ◦ Bursal disease
  ◦ Chicken infectious anemia
  ◦ Marek’s disease
  ◦ Newcastle
  ◦ Reovirus

Diseases associated with immunosuppression
  ◦ Inclusion body hepatitis, possible respiratory disease
# Differential Diagnosis

<table>
<thead>
<tr>
<th>Highest priority</th>
<th>Also Important</th>
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<tr>
<td>Enteric viruses</td>
<td>Hatch, transportation, environmental stress</td>
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<td>Ammonia</td>
<td>Mycotoxins and Nutrition</td>
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<td>Infectious bursal disease</td>
<td>Other disease stress</td>
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<td>Chicken infectious anemia</td>
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Broiler Runting Stunting Syndrome

Bursa Atrophy

Thymus Atrophy
Enteric viruses

Clinical signs
- 6-15+ days

Histopathology

PCR
- Astrovirus, Rotavirus, Reovirus, Parvovirus

Virus isolation
- Reovirus – cell culture
- Others (SPF embryos)

Astrovirus PCR
Ammonia

Clinical signs
  ◦ Photophobia
  ◦ Blindness

Flock inspection

Detection equipment

Histopathology
  ◦ Ulceration of cornea
Infectious Bursal Disease
Variant Bursal Disease Virus

No breeder vaccination  Breeder vaccination  Unchallenged control

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Infectious Bursal Disease - Gumboro

Clinical signs
- Flushing, fever, mortality 20-30 days

Pathology
- Swelling, hemorrhage of bursa - classical
- Atrophy of bursa – variants

Histopathology
- Acute infection
- Follicular restitution

Virus isolation (frozen tissue)

PCR
- Detection and typing using acute phase bursae (frozen) or FTA cards
Bursal Disease Pathogenesis
Progression of Lesions

Grade 1 Normal  Rapid Acute Necrosis
Chicken Infectious Anemia

Chicken infectious anemia

Clinical signs
◦ Blue wing and anemia in chicks

Pathology
◦ Thymus atrophy at any age

Histopathology
◦ Thymus lymphocyte depletion – severe

PCR
◦ Virus typing not essential
◦ Virus isolation difficult

Serology
Marek’s Disease
Marek’ Disease: Broilers or Young Breeders & Layers

HISTORY AND EPIDEMIOLOGY

Age of birds affected
Date first observed
Breeder flock
Hatchery source
Farm history

NECROPSY

Examine multiple birds
Record the incidence and severity of lesions
Examine skin, viscera, and nerves
Broilers or Young Breeders & Layers

HISTOPATHOLOGY & FTA CARDS

Skin lesions with 1 cm margin

Nerves from each chicken,
  ◦ Vagus, brachial plexus, and sciatic
  ◦ Select enlarged nerves if possible

Tumors

One eye from each affected chicken

Spleen, liver, kidney, gonad, brain, and proventriculus from each chicken

FTA Cards for PCR
  ◦ Enlarged feather follicles and tumors
Hatch and First-Week Stress

Hatch
- Uneven hatch
- Excess time in hatcher
- Insufficient water loss during incubation
- Dehydration and energy depletion
- Chick processing
- Formalin
- Exhausted chick problems

Transport
- Time, temperature

Placement
- Physical handling, thermoneutrality, food and water
Immunosuppressive Mycotoxins

Aflatoxin
Trichothecenes (T-2, DAS, others)
Fumonisins
Ochratoxin
Citrinin
Sterigmatocystin
Cyclopiazonic acid

Disease interactions: Coccidiosis, Marek’s disease, Salmonellosis
Mycotoxin Diagnostic Challenge

Appropriate feed samples are required

Transient, intermittent presence in feed

Limited laboratory capability for comprehensive testing

Chromatography
  - HPLC, GC, GC-Mass Spectroscopy

Rapid immunodiagnostic tests for individual ingredients
  - Feeds are more complex

Hot spot in feed.
Nutrition

Feeding a developing gut and the immune system
  ◦ First 20 days critical

Vitamin E
  ◦ Labile but essential to immune system

Disease places nutritional demand to support inflammation and tissue repair
  ◦ At expense of growth
Concurrent Disease Stress

Interfere with economic expectations of Gumboro vaccine program
- Runting stunting syndrome
- Chicken anemia
- Transmissible viral proventriculitis
- Marek’s disease

Acute infection may be immunosuppressive
- Reovirus
- Newcastle
Newcastle Disease - Lymphocyte Necrosis and Depletion

- Spleen
- Cecal tonsil
- Thymus
Monitoring Immunosuppression

Direct

Heterophil-lymphocyte ratio – stress
Interleukin-2
Whole blood lymphocyte stimulation assay – T-cells
Blood monocytes functional responses
cDNA Microarrays of genes that control immunity and inflammation

Not Practical
Monitoring
Immunosuppression - Indirect

Performance
Hatchery quality assurance
Record of clinical disease
Medication cost
Regular necropsy with lesion database
Serology
Histopathology
Agent detection and characterization
Practical Application

Consider immunosuppression aspects of management, nutrition, and disease

At necropsy, examine the **bursa and thymus** - standard procedure

Monitoring major immunosuppressive diseases and apply it consistently
- Bursa and thymus (Gumboro and Chicken infectious anemia)
- Intestine (viral enteritis)
- Spleen, nerve, eye (Marek’s)
- Value of data collected over time

Determine how the information is used
Monitoring Gumboro Disease Program 2

Examine flocks at age intervals – depends on the program
- 14, 21, 24/25, 28, 32, 35 days
- 18, 21, 25, 28, 32
- 21, 28, 35

Establish historical pattern
- Detect change in pattern
- Evaluate program changes

Bursa size

Histopathology - formalin

Freeze ½ bursa for virus isolation or molecular detection and characterization
Monitoring Gumboro Disease Program 2 - Modified

Additional immune system tissues for histopathology
- Thymus, spleen

Other
- Liver
- Proventriculus, intestine
- Other depending on type of problem

Goal: identify chicken anemia, enteric virus, proventriculitis, nonspecific digestive conditions
Immunosuppressive Interactions in Broilers

Hatch stress
Vaccination reaction

Bursal Disease
Chick Anemia
Marek’s, Viral enteritis, Mycotoxins
Other

Permanent Immunosuppression
Transient Immunosuppression

Bronchitis, Influenza, Paramyxovirus, LT, Pneumovirus
E. coli, Gangrenous Dermatitis, Coccidiosis

Cost, Livability
Feed Conversion
Condemnations

Hoerr, Avian Diseases 54, 2010
Summary

Recognize the signs and syndromes immunosuppression

Highest priority immunosuppressive diseases
◦ Enteric viruses, ammonia, infectious bursal disease, chicken infectious anemia, Marek’s disease

Also important
◦ Hatch, transportation, environmental stress; nutrition and mycotoxins; other disease stress

Monitor for immunosuppression and contributing factors
Thank You

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