Emerging Disease of Arthritis due to Novel Reoviruses in Broiler Chickens in California

H. L. Shivaprasad
California Animal Health and Food Safety Laboratory System, Tulare Branch
University of California, Davis

Acknowledgments
1. Drs. J. Ochoa, S. Stoute, G. Senties-Cue, M. Crispo and G. Cooper
2. Drs. R. Gallardo and R. Hauck
3. Dr. Beate Crossley
4. CAHFS staff

Hulimangala hosakote Lingareddy Shivaprasad

CAHFS Works in Partnership With
1. California Department of Food and Agriculture
2. School of Veterinary Medicine
3. Livestock and Poultry Producers
4. Veterinarians
5. United States Department of Agriculture (USDA)

California Animal Health & Food Safety Laboratory System
School of Veterinary Medicine
University of California - Davis

Mission
To provide the peoples of California and others with the highest quality diagnostic laboratory support for:
CAHFS Mission

1. Surveillance and response for Foreign Animal Diseases
2. Livestock and poultry disease control
3. Enhancement of livestock and poultry health
4. Ensuring the safety of foods of animal origin
5. Protection from animal diseases that can affect people (Zoonosis)
6. Equine health and performance
7. Recognition and dissemination of new knowledge

CAHFS’ Mission

California Animal Health & Food Safety Laboratory System

Services offered at each laboratory
Each of four laboratories offer services to match the needs of the animal populations located within the immediate vicinity of that laboratory.

<table>
<thead>
<tr>
<th>Services</th>
<th>Davis</th>
<th>Turlock</th>
<th>Tulare</th>
<th>San Bernardino</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteriology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immunology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Path/Histo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxicology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avian Virology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mamml. Virology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CAHFS’ Integration with NAHLN

Tests Essential for Disease Diagnosis
- History
- Clinical signs
- Necropsy (autopsy)
- Serology (ELISA, HA/HI, AGID, etc.)
- Immunology (FA, IHC, etc.)
- Biotechnology
- Bacteriology/Mycology

Tests (Contd.)
- Histopathology/Immunohistochemistry (AI, NDV, IBV, ILT, WNV, ABV, IBDV, Chlamydia, Trichomonas, Listeria, etc.)
- Parasitology
- Toxicology/Nutritional analysis
- Electron microscopy (DEM, TEM and SEM)
- Virology (egg embryos, cell culture)
- Hematology, serum chemistry, cytology
Biotechnology

- PCR (RT-PCR)
  - AI, NDV, vv/IBDV, IBV, ILT, Reo, Rota, Astro, WNV, Herpes, Adeno, Polyoma, PBFDV
- Bacteria (MG, MS, S. Enteritidis, Avibacterium), protozoa, fungi
- MLSA – MG (fingerprinting), RFLP - ILT
- 5.8S, 16S and 23S rRNA gene sequ for bacteria
- Sequencing - IBV
- Standardization and validation

Diagnostic Quality

- Quality/final diagnosis depends on the quality and quantity of effort by pathologist/diagnostician
- Rapid turn around time
- Thorough diagnostic work up
- Communication with the clients
  - Use friendly and easily understandable language
  - Client confidentiality maintained

Avian Reoviruses

- Ubiquitous viruses that cause various diseases of economic significance in chickens and other species of birds
- Genus: Orthoreovirus, Family: Reoviridae
  - Arthritis/tenosynovitis and tendon rupture in broiler chickens.
  - Virus is transmitted vertically
  - Was well controlled with vaccination of the breeders

Avian Reoviruses – Other diseases

- Malabsorption and running stunting syndrome (RSS) – very common
- Also been associated with respiratory and nervous system disease in chickens
- Immunosuppressive disease in chickens
- Myocarditis in chickens and turkeys
- Generalized disease in ducks, geese, pigeons, psittacines, etc.
Chickens with swollen hock joints – above
Chicken with synovitis and ruptured tendon - right

Emerging Reovirus in Broiler Chickens

- USA: 2011-2014 in Pennsylvania. Onset between 2 and 4 weeks of age
- Morbidity: 20 to 40 %, mortality 10 %
- Clinical signs, gross and histopathology
- Virus isolation and sequencing
- Numerous variants: 78 % distinct from vaccine strain, S1133. Novel reovirus
- France, other European count., China, etc.
- Numerous cases in SE USA, esp. Georgia

Emerging Disease of Reovirus in Broiler Chickens

- Disease in California, early 2015
- Numerous cases submitted to Tulare and Turlock laboratories
- Breeders - vaccinated for Reovirus
- Age of onset - about 20 days
- Outbreaks - birds being down on legs, unable to walk, leg/s stretched laterally, posteriorly or anteriorly

Reovirus in Broiler Chickens

- Increased morbidity (mostly culls) and mortality, lack of uniformity
- Bacteriology, gross and histopathology
- Virus isolation (cell culture - ID by EM) – tendons mostly, heart and occasionally liver
- Serology
- Molecular characterization
- PCR and IHC – under investigation
Reovirus in Broiler Chickens

- Bacteriology: Occasionally *E. coli* and *Staphylococcus aureus* isolated. Mixed viral and bacterial infections
- Serology: mostly negative in acute infections but moderate to high titers in subacute and chronic infections
- Virus isolation. Reovirus isolated better in early infections. Adenovirus isolated occasionally, significance unknown
- Molecular characterization
Reovirus in Broiler chickens

- Breeders vaccinated for S2133 Reovirus
- Clinical signs: starts @ 10 to 15 days of age
- Vertical transmission
- Tenosynovitis/arthrosis
- Hydropericardium – epicarditis and myocarditis. Occasionally hepatitis
- Virus isolated and characterized
- Variants, variants to variants, etc.
- Breeders are vaccinated with variants

Thank you