

# Newcastle Disease

*Exotic Newcastle Disease, Pseudo-Fowl Pest, Pseudovogel-Pest, Atypical Geflugelpest, Pseudo-Poultry Plague, Avian Pest, Avian Distemper, Ranikhet Disease, Tetelo Disease, Korean Fowl Plague, and Avian Pneumoencephalitis*

# Overview

- Organism
- Economic Impact
- Epidemiology
- Transmission
- Clinical Signs
- Diagnosis and Treatment
- Prevention and Control
- Actions to take



# The Organism

# Newcastle Disease

- Family Paramyxoviridae
  - Genus *Avulavirus*
- 9 serotypes APMV-1 to APMV-9
- Newcastle disease is APMV-1

# Newcastle Disease

- Four pathotypes:
  - Asymptomatic enteric - Subclinical
  - Lentogenic
    - Subclinical to mild respiratory
  - Mesogenic
    - Respiratory or neurological
  - Velogenic
    - Neurotropic: Respiratory or neurological
    - Vicerotropic: Hemorrhagic intestinal lesions

# Newcastle Disease

- vND: virulent Newcastle Disease
  - Includes:
    - Mesogenic
    - Velogenic neurotropic
    - Velogenic viscerotropic



# Importance

# History

- 1926
  - Java, Indonesia
  - Newcastle-upon-Tyne, England
- Probable earlier outbreaks in Central Europe
- 1896: Western Scotland, cause of death of all chickens?
- 4 panzootics from 1926 to 1981



# History in U.S.

- 1950: First U.S. case
  - Partridges and pheasants imported from Hong Kong
- 1971-74: California outbreak
  - 1,321 infected and exposed flocks
  - 12 million birds destroyed
  - \$56 million dollar cost to tax payers
- Outbreaks in the U.S.
  - Due to illegal importation of exotic birds and poultry

# History in U.S.

- 2002-2003: California outbreak
  - 2,662 premises depopulated
  - 4 million birds destroyed
  - \$160 million dollar cost



# Economic Impact

- Global economic impact enormous
  - More costly than any other animal virus?
  - Continued control measures expensive
  - Repeated testing for trade purposes

# Economic Impact

- Developing countries
  - Effects quality and quantity of dietary protein
  - Significant effect on human health

# Epidemiology

# Geographic Distribution

- Endemic
  - Asia, the Middle East, Africa, Central and South America
- Vaccine use makes assessment of true geographical distribution difficult
- International monitoring
  - By the FAO and OIE

# Morbidity/Mortality

- Morbidity: Up to 100%
- Mortality: 90%
- Varies greatly depending on
  - Virulence and strain
  - Avian species and susceptibility of host
  - Environmental conditions
  - Secondary infections
  - Vaccination history
- Some species show few or no signs
  - Carrier state may exist

# Transmission



# Animal Transmission

- Direct contact with feces and respiratory discharges
- Contamination of the environment
  - Feed, water
  - Equipment
  - Human clothing
  - Contaminated or incompletely inactivated vaccines



# Animal Transmission

- Survives for long periods in the environment
- Incubation period: 2-15 days
  - 5-6 days average
- Migratory birds, feral pigeons
  - Contamination of poultry feed

# Human Transmission

- Mild conjunctivitis
  - Virus shed in ocular secretions for 4-7 days
  - Avoid contact with avian species during this time
- Lab workers and vaccination crews most at risk
- No cases from handling or consuming poultry products
- No human-to-human spread

# Animals and Virulent Newcastle Disease

# Clinical Signs

- Drop in egg production
- Numerous deaths within 24-48 hours
- Deaths continue for 7-10 days



# Clinical Signs

- Edema of head, especially around eyes
- Greenish-dark watery diarrhea
- Respiratory and neurological signs
- Signs vary with species and virulence



# Post Mortem Lesions

- Indistinguishable from highly pathogenic avian influenza
- Hemorrhagic internal lesions
  - Tracheal mucosa
  - Proventriculus
  - Intestinal mucosa



# Post Mortem Lesions

- Edema of the head and neck
- Edema, hemorrhage, necrosis or ulceration of lymphoid tissue
- Lesions vary with species and virulence





# Differential Diagnosis

- Highly pathogenic avian influenza
- Fowl cholera
- Laryngotracheitis
- Coryza
- Fowl pox (diphtheritic form)
- Psittacosis or Pacheco's disease
- Mycoplasmosis
- Infectious bronchitis
- Management problems
  - Water or feed deprivation
  - Poor ventilation

# Clinical Diagnosis

- Sudden decrease in egg production
- High morbidity and mortality
- Characteristic signs and gross lesions



# Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease
- Samples may be zoonotic

# Diagnosis

- Laboratory Tests
  - Virus isolation
  - Virus characterization
    - To determine virus strain and pathogenicity
  - Serology
    - No strain information, so limited value
    - May be used post-vaccinal to confirm immune response

# Newcastle Disease in Humans

# Clinical Signs in Humans

- Eye infections
  - Reddening, excessive tearing, edema of lids, conjunctivitis, subconjunctival hemorrhage
  - Usually transient, cornea not affected
  - Lab workers and vaccination crews most susceptible
  - No human to human spread

# Prevention and Control

# Recommended Actions

- Notification of Authorities
  - Federal:  
Area Veterinarian in Charge (AVIC)  
[www.aphis.usda.gov/vs/area\\_offices.htm](http://www.aphis.usda.gov/vs/area_offices.htm)
  - State veterinarian  
[www.aphis.usda.gov/vs/sregs/official.htm](http://www.aphis.usda.gov/vs/sregs/official.htm)
- Quarantine all suspect animals and the premises



# Recommended Actions

- Confirmatory diagnosis
- Depopulation may occur
  - Proper destruction of
    - Exposed cadavers
    - Litter
    - Animal products



# Control and Eradication

- Disinfection of premises
- Delay re-introduction of new birds for 30 days
- Control insects and mice
- Limit human traffic



# Disinfection

- Virus killed by:
  - Household bleach, 6%
  - Extremes in pH
    - Less than 2 or greater than 12
  - Heat
    - Boiling one minute
  - Detergents
  - Dryness
  - Ultraviolet light and sunlight

# Vaccination

- Vaccination routine worldwide
- Reduces clinical signs
- Does not prevent virus replication or shedding
- Not an alternative to good management, biosecurity or good hygiene in rearing practices

# Additional Resources

# Internet Resources

- World Organization for Animal Health (OIE) website
  - [www.oie.int](http://www.oie.int)
- USAHA Foreign Animal Diseases – “The Gray Book”
  - [www.vet.uga.edu/vpp/gray\\_book/index](http://www.vet.uga.edu/vpp/gray_book/index)

# Acknowledgments

*Development of this presentation was funded by a grant from the Centers for Disease Control and Prevention to the Center for Food Security and Public Health at Iowa State University.*

# Acknowledgments

## **Author:**

Katie Steneroden, DVM

## **Co-authors:**

Anna Rovid Spickler, DVM, PhD  
Radford Davis, DVM, MPH, DACVPM

## **Reviewer:**

Bindy Comito Sornsin, BA