

Critical Aspects of Biosecurity After a Viral Respiratory Disease Outbreak in the Field

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Outline

- Review of prevalent viral respiratory diseases in Peru
 - Newcastle disease
 - Infectious Laryngotracheitis
 - Outbreak control strategies
- Outbreak response and disease control strategies in the U.S.
 - Exotic Newcastle disease
 - Infectious Laryngotracheitis
 - Avian Influenza
- Critical biosecurity practices after an outbreak
 - Can "one size fit all"?
 - Planning, Preparedness, Response, and Recovery
 - Importance of education and training
- Summary and Conclusions

Review of Prevalent Viral Respiratory Diseases of Poultry in Peru

- Newcastle Disease (ND)
- Infectious Laryngotracheitis (ILT)


Question: Why do we need to review these diseases?

Answer: We cannot prevent and control these diseases if we do not know their etiology, epidemiology, and pathogenesis.

- *In other words, you cannot defeat your enemy if you do not know its strengths and weaknesses.*

Newcastle Disease

- A viral disease of many poultry, and wild and cage birds
- Affects primarily chickens and turkeys
- Worldwide distribution





Etiology

- Avian Paramyxovirus Type 1 (APMV-1)
- Strains classified according to pathogenicity:
 - Lentogenic (BI, La Sota)
 - Mesogenic (Mukteswar, Roakin)
 - Velogenic (Milano, Herts, Texas GB)
- Velogenic strain (virulent Newcastle disease or vND) is the most pathogenic and economically devastating
 - also referred to as Exotic Newcastle Disease (END)

Transmission and Spread

- Direct contact between healthy birds and the bodily discharges of infected birds
- Spreads rapidly among birds in confinement, such as commercially raised chickens
- Can be spread by mechanical means, including contaminated shoes and clothing, from an infected flock to a healthy one
- Often is spread by poultry workers such as vaccination and debeaking crews, manure haulers, rendering-truck drivers, feed delivery personnel, poultry buyers, egg- service workers, and poultry farm owners and employees
- Contaminated items such as feed, water, tools, premises, human clothing

Ref: <http://www.cidrap.umn.edu/cidrap/content/biosecurity/ag-biosec/anim-disease/exnewcastle.html>

Clinical Signs

- **Lentogenic:** adults may show only respiratory signs and drop in egg production
- **Mesogenic:** mild respiratory signs; eggs from infected hens may be soft-shelled, roughened, or deformed
- **Velogenic:** gasping, coughing, nasal discharge, incoordination, paralysis, twisted neck, discolored comb



Prevention

- Vaccination with live or killed vaccine
- Biosecurity
 - **Keep your distance.** Isolate your birds from visitors and other birds.
 - **Keep it clean.** Prevent germs from spreading by cleaning shoes, tools and equipment.
 - **Don't carry disease home.** Also clean vehicles and cages.
 - **Don't borrow disease from your neighbor.** Avoid sharing tools and equipment with neighbors.
 - **Know the warning signs of infectious bird diseases.** Watch for early signs to prevent the spread of disease.
 - **Report sick birds.** Report unusual signs of disease or unexpected deaths.

Ref: http://www.aphis.usda.gov/animal_health/birdbiosecurity/biosecurity/basicspoultry.htm

Newcastle disease outbreaks in Peru (2010-2011)

Date Reported	Location	Type of Birds	Number Affected/Total Population	Causal agent
02/15/2011	La Libertad	Backyard (fighting)	4/75	APMV-I
12/17/2010	La Libertad	Backyard breeders (fighting)	35/100	APMV-I
08/25/2010	Cajamarca	Backyard poultry	3/25	APMV-I
07/23/2011	La Libertad	Fighting birds	27/211	APMV-I
05/17/2010	Cajamarca	Backyard breeders (fighting)	30/45	Velogenic NDV
02/25/2010	Cajamarca	Backyard flock	12/20	APMV-I

Ref: OIE Country Report - Peru

Control Measures vND Outbreak

Backyard holding breeding fighting cocks in an urban area
Cajamarca, Peru
05/17/10

- **Quarantine** on the holding and culling of in-contact birds.
- **Disinfection** of the whole holding.
- **Training** of farmers breeding fighting and backyard birds on biosecurity, on the risks of the disease and on reporting suspected cases.
- **Vaccination** campaign in the focal and protection areas, giving priority to fighting birds.
- **Slaughter** of all live poultry remaining on the holding.
- **Inspection** of birds in other areas (beyond 3km radius), without any observed clinical evidence of the disease. 15 backyard and fighting bird farms were **tested** around the outbreak.

Ref: OIE Country Report - Peru

Control Measures END Outbreak California, 2002

- Strict **quarantine** and **destruction** of all birds infected with END is necessary to eradicate the virus from an area.
- After **cleaning and disinfection** is complete, no birds should be reintroduced into depopulated facilities for at least 30 days.
- Contaminated **manure must be safely removed** by:
 - Burying (at least 5 feet deep)
 - Composting
- Any insects or mice that could act as potential vectors need to be destroyed prior to the destruction of birds.
- Cresylics or phenolic disinfectants should be used after thorough cleaning of all surfaces and equipment.



Ref: <http://www.cidrap.umn.edu/cidrap/content/biosecurity/ag-biosec/anim-disease/exnewcastle.html>

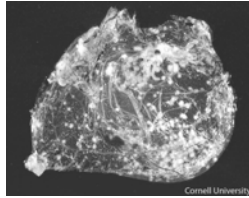
Infectious Laryngotracheitis (ILT)

- Acute respiratory disease of chickens characterized by conjunctivitis, respiratory distress, and expectoration of bloody mucus
- Affects chickens, pheasants, and peafowl
- Occurs worldwide in major poultry production regions, often causing severe economic losses



Etiology

- Herpesvirus (DNA virus)
 - does not survive well outside the host but can persist longer in moist, cool environments
 - very sensitive to heat, drying, and most disinfectants



Transmission and Spread

- Spread through infected birds and improperly administered live vaccines
- Airborne transmission or through contaminated equipment, shoes, and clothing



Clinical Signs

- Respiratory distress, coughing, sneezing, expectoration of bloody mucus
- Conjunctivitis and facial swelling



Prevention

- Vaccination
 - Chick Embryo Origin (CEO), Tissue Culture Origin (TCO), or recombinant vaccines
 - Do not vaccinate if the disease is not present or has not occurred in your area
- Biosecurity
 - Do not allow visitors to your farm nor visit other farms
 - Do not share equipment and vehicles
 - Clean and disinfect poultry house, coops, and equipment regularly and between flocks
 - **NOTE: People, not birds, usually spread ILT!**

Control Measures

ILT Outbreak in Poultry
Arequipa, Peru
04/01/09

- Quarantine on the poultry farm, with restrictions on the bird movements in and out of the infected site, and quarantine on the whole area.
- Burning of the dead birds within the breeding area and away from the barns.
- Ongoing passive and active surveillance.
- Blood and tracheal swabs sampling on adjacent farms.
- Information to other farmers in the neighbouring areas in order to take the necessary precautions to avoid contamination and spread of this disease.
- Vaccination of poultry present in the Production Site Mollendo II and in the adjacent areas considered areas at risk using an inactivated vaccine.
- Inspection of the nearby farms, commercial farms, backyard poultry and fighting birds.
- Examination of birds showing signs and lesions compatible with avian infectious laryngotracheitis.

Ref: OIE Country Report - Peru

Characteristics of Recent ILT Outbreaks in the U.S.

- Most outbreaks are vaccine-induced (Vaccinal LT or VLT) (Dufour-Zavala, 2008)
 - CEO vaccines administered to broilers via drinking water for practical reasons but poor uniformity results in sub-population of non-vaccinated birds which may develop clinical disease
 - Live CEO vaccine virus may revert to virulent form
 - Recovered and/or vaccinated birds can become long-term carriers (latency)
- Recent outbreaks on Delmarva have been attributed to people ("walk-in") or airborne transmission ("blow-in") (Ritter, 2007)
- Contact with and movement to processing of incubating flocks is a huge obstacle to control of LT in densely populated poultry growing areas (Ritter, 2007)

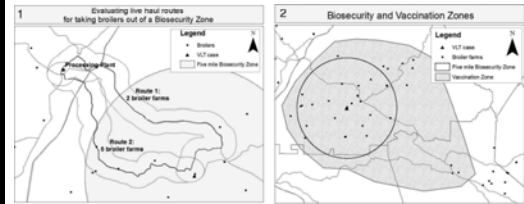
Control Measures ILT Outbreaks in U.S.

- **General biosecurity:**
 - Growers must be educated to separate farm activities and all other off-farm activities
 - Dedicated clothing and footwear must be used exclusively on the farm, and showering after off-farm activities and prior to attending to the chickens is encouraged
 - Equipment-sharing is discouraged and cleaning and disinfection of equipment that must be shared prior to entry and departure is necessary
 - Company biosecurity for servicemen, feed deliveries, chick deliveries, and catch crews must be stressed
 - During an outbreak, zoning of these activities between the affected and unaffected zones must be practiced.

Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S.

- Use of geographic information systems (GIS) for:
 - disease surveillance
 - outbreak control
 - routing of live haul trucks
 - creation of quarantine, vaccination, and surveillance zones
 - emergency management



Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

- **Formation of a committee**
 - May consist of representatives from broiler companies and growers of commercial layers and noncommercial birds within a state.
 - May include laboratory personnel and representatives from universities and government agencies.
 - The goal is to have a concerted effort toward working together for the control of ILT.
- **Rapid diagnosis**
 - No live birds from suspected cases of ILT should be submitted to the laboratory.
 - 6 to 7 recently euthanized birds with typical clinical signs should be brought to the laboratory in triple bags, with the outer bag being spray disinfected.
 - The service truck must be sprayed with disinfectant inside and out.



Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

- **First case**
 - The positive farm must be immediately isolated.
 - Service visits to the farm should stop.
 - The birds should be taken to processing as soon as possible.
 - After the birds are caught, the house is heat-treated at 38C (100F) for 100 hours. The litter may also be composted outside the house. (In-house composting of litter is highly recommended)
 - Any stray chickens or dead chickens left behind by the catchers must be properly disposed of before the litter treatment starts.
 - The affected farm should have a sanitary down time of a minimum of 3 weeks.
 - An alternative to this is to remove the litter and compost it under plastic outside of the house and wash down and disinfect the premises.



Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

- **First response: communications and biosecurity zone**
 - After a diagnosis of ILT, the poultry industry of the entire state must be notified.
 - The virus isolated from the first case must be genotyped to establish its relatedness to vaccine viruses.
 - The notifications of the disease as VLT is to prevent people from spreading vaccine virus around, hence the importance of the **first step in control: biosecurity**.
 - The index case is immediately mapped using GIS, and a 5-mile zone is drawn around it for biosecurity measures to be enhanced immediately for all identified farms within such a zone.
 - It is critical to respond after the very first case, and not to wait for a second and a third case. A rapid first response should result in small number of cases per outbreak.
 - Enhanced biosecurity for all the broiler farms means a minimum down time of 2 weeks, limiting the visits to the essential (stop service visits) and stopping clean-out of houses and litter spreading.

Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

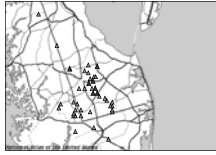
- **Considerations for vaccination**
 - Although broiler vaccination is very effective in preventing new cases, it has some disadvantages:
 - it introduces a large amount of CEO vaccine virus in the area
 - the vaccine virus can become latent
 - vaccinated birds may shed virus on the way to the processing plant and spread ILTV
 - vaccine reactions are sometimes severe, causing poor weight gain and feed conversion, increased mortality, and sometimes airsacculitis and condemnations at processing
 - The decision to vaccinate depends on these important factors:
 - subsequent cases with no epidemiological connections
 - cases jumping the boundaries of the biosecurity zones
 - cases in vaccinated long-lived birds (layers and breeders)
 - the frequency of diagnoses (cases occurring in rapid succession spur the decision to vaccinate)

Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

Vaccination and litter management

- The CEO vaccine is currently the most practical ILT vaccine for broilers.
- As companies start vaccinating, house clean-out and litter spreading must be stopped for a period of approximately 6 weeks.
 - This helps prevent the disease on these farms.
- After the entire zone is vaccinated, clean-out can resume and litter can be spread within the zone.
 - This is permissible because, although the litter may be infectious, there are no longer any susceptible chickens in the zone to infect.
- If litter is to be taken out of the zone, it must be heat treated at 38C (100F) for 100 hours or composted inside or outside of the house for a minimum of 5 days before being taken out of the zone to areas where no chickens are grown.



Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

Protecting long-lived birds (layers and breeders) interspersed with affected broilers

- Pullet managers may decide to intensify their vaccination program in light of a broiler outbreak by vaccinating twice instead of once:
 - The first vaccination is given at 3–6 weeks of age by water using the CEO vaccine, and the second (CEO or TCO) by eye drop at the usual 10–12 weeks of age.
- Breeders and layers that break will usually get revaccinated with CEO vaccine, usually in the drinking water, without adverse production effects.

Ref: Dufour-Zavala, 2008

Control Measures ILT Outbreaks in U.S. (cont).

Non-commercial (backyard) poultry

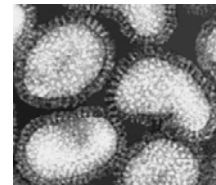
- Backyard birds can represent a significant source of ILT virus for other poultry.
- Outreach (through education/communication) to the non-commercial segment of the poultry industry is important for an ILT control program to be successful.
- Vaccination of exhibition flocks should be encouraged.
- Non-commercial flock owners can be alerted on ILT outbreaks through feed stores or trade newspapers.



Ref: Dufour-Zavala, 2008

Avian Influenza

- An infectious disease of birds (chickens, pheasants, turkeys, quail, ducks, geese, guinea fowl) caused by type A strain of influenza virus
- Occurs worldwide



Etiology

- Orthomyxovirus
 - Very sensitive to most detergents and disinfectants
 - Readily inactivated by heating and drying
 - Well-protected from inactivation by organic material; infectious virus can be recovered from manure for up to 105 days
- Various serotypes
 - H5 and H7 strains are of greatest concern to the poultry industry because of their ability to mutate from low pathogenic AI to highly pathogenic AI

Transmission and Spread

Waterfowl (such as ducks and geese) act as a natural reservoirs of avian influenza virus by carrying the virus in their intestinal tract and shedding it in their feces.

Avian influenza viruses are spread to susceptible birds through inhalation of influenza particles in nasal and respiratory secretions and from contact with the feces of infected birds.

- Infected birds shed virus in saliva, nasal secretions and feces in the first two weeks of infection



Clinical Signs

- **Low Pathogenic AI**
 - Mild respiratory signs
 - Minimal mortality
- **Highly Pathogenic AI**
 - Severe clinical signs
 - High mortality



Prevention

- Prevent direct contact with free-flying birds and protect domestic poultry from contact with the feces of wild birds
- Prevent contact between newly infected and susceptible birds
- Control the traffic between infected and uninfected farms
- Avoid contact with live poultry markets

Control

- Enhanced biosecurity
- Quarantine of infected premises/areas
- Depopulation (destruction) of infected birds/flocks ("stamping out")
 - Carbon dioxide
 - Water-based foam
- Proper disposal of infected carcasses
 - Composting
 - Burial
 - Incineration
 - Rendering
 - Landfill
- Proper disposal of manure by composting or burial
- Decontamination (cleaning and disinfection)

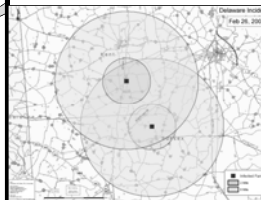
Control Measures LPAI H7N2 Outbreak Delmarva Peninsula 2004

- Enhanced biosecurity
- Quarantine
- Depopulation (carbon dioxide)
- Disposal (in-house composting)
- Decontamination (cleaning and disinfection)
- Surveillance
- Rapid diagnosis (real time RT-PCR)

Enhanced Biosecurity



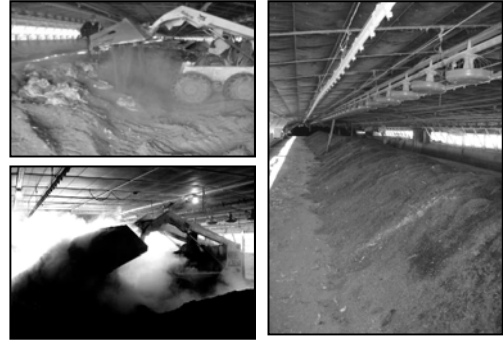
Quarantine



Depopulation (CO₂)



Disposal (in-house composting)



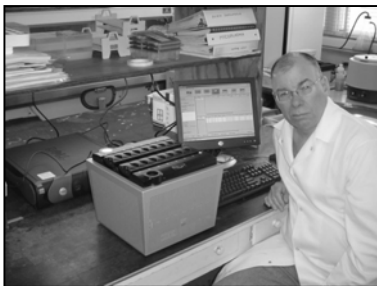
Decontamination



Surveillance



Rapid Diagnosis (Real Time RT-PCR)



Critical biosecurity practices after a viral respiratory disease outbreak

- Can "one size fit all"? NO!
- Every situation is different, therefore, biosecurity practices must be adjusted according to the type of disease and the magnitude and severity of the outbreak.
- Emergency Preparedness, Response, and Recovery
 - Emergency preparedness and response guidelines must be in place at all times and reviewed/revised regularly.
 - Guidelines on mitigation and recovery must be included in any emergency plan.
- Importance of education and training
 - Poultry industry personnel, growers, workers, government representatives, and emergency responders must be educated and trained on biosecurity practices.

Summary and Conclusions

- Biosecurity and emergency preparedness and response guidelines must be in place at all times and must be reviewed and revised regularly.
- Education and training of all sectors of the poultry industry are critical to the success of any biosecurity and emergency preparedness program
- Rapid and accurate diagnosis are absolutely necessary
 - Poultry growers and backyard flock owners must be trained to recognize and report signs of diseases such as AI, vND, and ILT to proper authorities.
 - Reports from poultry growers/flock owners must be investigated and samples collected to confirm if a reportable disease such as ILT, vND, or AI is present.
 - A quick and accurate diagnosis of the disease will determine the type and level of biosecurity and emergency response measures.
- Reporting and dissemination of information to all concerned parties, including the general public, is essential.
- **Biosecurity is:**
 - **an investment, not an expense**
 - **necessary, not optional**
 - **a team effort**

Muchas Gracias!

