

"Social Distancing for DUMMIES: A reference for Chickens"

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Introduction

The following case report will highlight a respiratory disease in poultry using current literature to correlate the importance of biosafety and prevention in backyard chicken flocks and poultry production alike. Infectious laryngotracheitis virus (ILTV) is a member of the subfamily, Alphaherpesvirus 1 and causes infection in chickens and other bird species such as turkeys, peafowls, and pheasants⁵. This disease is economically impactful with mild disease resulting in low mortality of 0.1% to 2% but severe disease resulting in a variable 5% to 70% mortality. ILTV has an incubation time of 1 to 2 weeks with a varying course of disease averaging 10 to 14 days. Chickens of all ages are susceptible to ILTV with birds over 3 weeks being the most often affected⁵. Clinical symptoms can manifest as serous ocular and nasal discharge, sneezing, decreased egg production and failure to thrive. Some backyard chickens may show only mild signs or are asymptomatic, however commercial birds tend to have more severe disease—commonly presenting as bloody oral discharge, coughing, and respiratory difficulty. After initial infection, infected birds are considered life-long carriers and will shed the virus during the most contagious time of infection, while clinical signs prevail.

This case report will review the pathophysiology, transmission of viral antigens, clinical signs, diagnostics, and appropriate management and prevention strategies of the disease of an individual backyard bird initially presented to the Poultry Research and Diagnostic Laboratory of Mississippi State University, College of Veterinary Medicine.

History and Signalment

On November 17th, one dead intact female chicken from a small backyard flock presented to the Poultry Research and Diagnostic Laboratory for necropsy from a local veterinarian. The

chicken presented, dead, to the referring veterinary clinic on November 15th with a history of respiratory signs including sneezing, coughing, and open-mouthed breathing. Multiple other chickens in the flock died, showing similar signs and symptoms. It should be noted that due to the delay of submission, the carcass underwent extensive tissue autolysis prior to necropsy.

Diagnostic Approach

Upon gross evaluation, there was severe redness and inflammation along the tracheal mucosa with loosely adhered fibrin material. White yellowish plaques were at the commissure of the mouth extending into the nasal choana. Grass was found in the gizzard along with severe gizzard erosions. No other gross abnormalities were found within the intestinal tract. The kidneys were moderately swollen. Extremely brittle cortical bone was noted primarily in the femurs upon evaluation of the bone marrow. The gross lesions appreciated in the oral commissure, oropharynx, and trachea were highly suggestive of either fowl pox or infectious laryngotracheitis (ILT). Representative tissue samples from these regions along with sections of the lung, heart, ovaries, kidneys, spleen, liver, and proventriculus were collected for histological evaluation.

The mucosal epithelium of the oral commissure and oropharynx was mildly congested, moderately hyperplastic with focal ulcerations and erosions. Cellular debris covered the mucosal surface—and was composed of mixed bacteria and degenerate heterophils. Mucosal epithelial cells displayed ballooning cell degeneration and occasional cells contained rare small, pale, eosinophilic, intracytoplasmic viral inclusions, , a classic lesion indicative of fowl pox infection.

Small to moderate numbers of heterophils were present in the lumen of the oropharynx. The respiratory mucosal epithelium was extensively attenuated. Prominent nodular aggregates

of lymphocytes were also observed in the submucosa. The squamous mucosal epithelium of the oropharynx was mildly congested and moderately hyperplastic with moderate hyperkeratosis. The mucosa was focally eroded and infiltrated with heterophils. Multifocal aggregates of lymphocytes and plasma cells were present in the lamina propria.

Histological evaluation of the trachea revealed marked heterophilic, lymphocytic, and ulcerative tracheitis with rare syncytial cells, and intranuclear viral inclusion bodies, supporting the diagnosis of ILT. Infectious laryngotracheitis was confirmed via a positive real-time PCR result. Due to the nature of the blood-tinged exudate within the trachea, a sample of the trachea was also swabbed and submitted for Avian Influenza PCR and was negative. Additionally, the presence of abundant lymphocytic nodular inflammation within the tracheal submucosa suggested a possible concurrent infection with a *Mycoplasma* spp. No other abnormalities were noted.

Pathophysiology

Avian infectious laryngotracheitis is a commonly reportable respiratory disease of chickens older than 20 days. In many cases, it presents as an ocular disease, manifesting as crusting, serous or mucous-ocular discharge. Infectious laryngotracheitis virus (ILTV) belongs to the Alphaherpesvirinae of the Herpesviridae family. ILTV can be horizontally transmitted through oral and nasal secretions or droplets via airborne transmission. The virus tends to concentrate in leukocytes and the plasma of infected chicken¹ and thus can be transmitted through hematogenous spread. This virus primarily localizes in the upper respiratory tract and affects the tracheal mucosa as well as the conjunctiva to cause progressive inflammation, sero-hemorrhagic to muco-hemorrhagic discharge in severe cases, coughing and dyspnea with intraluminal tracheal necrotic plugs.

Gross and histopathologic findings usually consist of esophagitis, pharyngitis, fibrinonecrotic exudate and hemorrhages within the trachea along with tracheitis, and syncytial cell formation with intranuclear viral inclusion bodies within the respiratory epithelium³. Although histopathology is used as a screening test for rapid detection of suspected ILT cases, it is not conclusive if syncytial cells are not detected. Confirmatory tests such as fluorescent antibody are used to identify viral antibodies whereas real-time PCR and immunohistochemistry are used to detect the viral antigen in cells³. In acute phases of infection, ILTV may invade the tracheal epithelium, migrating to the trigeminal ganglion to establish latency⁵.

It is not uncommon for the clinical signs of ILTV to appear similar to those of wet fowl pox. So, with the intracytoplasmic inclusion bodies present in this carcass, it is important to define what differentiates fowl pox from ILTV. Derived from the poxvirus family, fowl pox is known as a significant viral pathogen amongst over 200 species of birds. Although it is well controlled with vaccination in commercial flocks, it has not yet been eradicated and still can cause significant morbidity and mortality in backyard flocks. Fowl pox is mechanically transmitted by insects such as mosquitoes. When infected, birds develop either one or both of its forms: dry and wet. Dry fowl pox manifests as whitish wart like lesions on non-feathered areas such as the head, legs, and vent, which tend to heal approximately two weeks from onset. The wet form is most mistaken for ILT due to the presence of diphtheritic membranes in the mouth and pharynx, which can ulcerate or erode mucous membranes. Unlike the dry form, wet fowl pox manifests as marked respiratory involvement that often leads to mortality. The most distinctive lesions that separate ILT from wet fowl pox are the intracytoplasmic viral inclusions in lesions, which serve as a confirmatory diagnosis for fowl pox infection.

Newcastle disease is rarely considered a differential to be ruled out from infectious laryngotracheitis virus disease. It is a precautionary measure to test for this disease due to the severity of respiratory and ocular lesions. Newcastle disease (ND) is caused by a paramyxovirus that when infected, some affected birds may show one or more of the severe neurological, respiratory, and gastrointestinal signs. Common gross findings that are suggestive and often confirmatory of Newcastle disease are an enlarged sciatic nerve, dropped wings, paralysis with dragging legs, and torticollis. All of which, were not visualized in this case.

Management, Control, and Prevention

Infectious laryngotracheitis virus is introduced into backyard flocks by several mechanisms ranging from mechanical infection such as insect bites, carrier birds, to the movement of people or equipment. Preventative measures are commonly implemented to avoid decreased production and loss of up to 50% in severe outbreaks⁴.

Vaccination is not innately a major mechanism of prevention. In fact, the Mississippi Board of Animal Health restricts the sale and use of vaccination for ILT unless approved by the state veterinarian. When implemented, vaccinations are administered with caution as to not induce infection in unvaccinated chickens. The vaccine types are modified live or recombinant vaccines. The main modified live vaccines are chick embryo origin (CEO) and tissue culture origin (TCO) while the main recombinant versions are the pox-vectored vaccine,⁸ and the HVT Marek's disease virus derived ILT vaccine. The State Veterinarian must approve the use of CEO vaccine prior to use as its' use is tightly restricted –while, TCO is generally encouraged for routine vaccination of commercial egg layers and broiler breeders. Regional restrictions apply for ILTV vaccinations within each state. Recombinant/vectored or modified

live/tissue culture vaccines may be used alone or combined judiciously as to maximize performance and protection⁶.

One or two doses of a modified live virus vaccine are routine but may lead to post-vaccination reactions. ILTV vaccination has not yet been perfected, as safety, handling, and immunogenicity battle for the most effective choice⁵. The Innovax-ILT that utilizes the HVT Marek's disease has begun to show promise in producing anti-ILT antibodies without initiating costly vaccine reactions like in conventional live-vaccines. Vaccination of layers, broilers, or breeders can be administered in the first weeks of age as in-ovo injections⁷.

Vaccination strategies tend to depend on the type and use of the bird. Historically, layers would receive a one dose immunization of Chick Embryo Origin (CEO) at six to eight weeks by eyedrop followed with a one-dose booster by water, eyedrop, or coarse spray at 12 to 15 weeks. On the other hand, broilers are not always subject to vaccination as they suffer from post-vaccination reactions and increased likelihood of developing other upper respiratory diseases⁸. In the case of a break or a high-risk of infections, broilers are vaccinated at 12 days old with a CEO vaccine solution in their water troughs.

It has been determined that biosecurity measures are emphatic at keeping ILT at bay. Because this virus can survive on surfaces for long periods of time, it is best to implement adequate disinfection and sanitation procedures; being sure to regulate ventilation, humidity, and temperature in the poultry houses. It is also beneficial to maintain water sources free from contamination to avoid horizontal transmission within the flock. If at any time ILT is detected in a flock, it is recommended that at the time of diagnosis, the owner of the flock should institute a depopulation protocol and subsequently cull infected flocks as there is no effective treatment against ILT⁸. Houses that contain ILT-positive flocks should be routinely sprayed with a

disinfectant⁴. Recommendations suggest that affected birds are maintained in quiet and calm environments with minimal dust to help relieve symptoms.

Implementing these measures may initially be expensive, but without controlling these factors, the impact of ILTV can be devastating to the financial livelihood of the producer.

Conclusion

Infectious laryngotracheitis is a reportable disease in Mississippi poultry. The Mississippi State Vet is to be notified of any positive diagnoses and dependent of the poultry type, use, and location, will act accordingly to control further spread of the disease. The way in which ILT is managed and controlled varies from state to state. The Mississippi Board of Animal Health strictly prohibits the use of any use of ILT vaccinations, especially that of CEO type vaccines. Broilers are not routinely vaccinated for ILT. TCO vaccines are approved –not required—for routine use in older birds in commercial settings such as commercial egg layers and broiler-breeders. TCO is milder and less likely to spread from bird-to-bird. TCO vaccines are less likely to result in moderate to severe vaccination reactions unlike CEO vaccines, which are known to cause outbreaks. In the case of backyard birds, ILT vaccines are not generally encouraged for fear of mishandling or mismanagement.

It should be noted that because this case involved a backyard chicken flock, the state Veterinarian was notified for the protection of commercial flock involvement. There are certain protocols to be taken after a positive diagnosis in commercial flocks. Typically, the affected farm will undergo an official quarantine in which no bird can enter or exit the farm without a permit until the quarantine is lifted. The farm must then be thoroughly cleaned and disinfected, and two negative test results must be obtained before quarantine is lifted. Infectious

laryngotracheitis in backyard flocks, can be devastating—but with the right precautionary measures, it can be prevented.

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