Biosecurity/ Respiratory /Regulatory Diseases of Backyard Poultry

Kelli H. Jones, DVM, MAM, diplomate ACPV

Affiliation: From Ceva Biomune, 8906 Rosehill Rd, Lenexa, KS 66215, USA
(Formerly of Mississippi State University, Poultry Research and Diagnostic Laboratory, College of Veterinary Medicine- Associate Clinical Professor of Poultry Medicine)

Abstract: This report highlights important aspects of biosecurity practices, important respiratory diseases, and regulatory issues of backyard type poultry. The importance of biosecurity in backyard flocks in preventing disease transmission is discussed in detail. In addition, reportable and other commonly encountered respiratory diseases are discussed. Finally, regulatory issues dealing with small backyard flocks are reviewed and references for further information are provided.

Key Words: biosecurity, poultry, backyard, regulatory, NPIP, avian influenza, New Castle Disease, respiratory diseases of poultry, reportable/notifiable diseases

Biosecurity for Backyard Poultry

Biosecurity is a practice intended to limit the introduction and potential spread of disease onto a farm. This goal is accomplished by several practices such as minimizing traffic of potential disease-causing agents (viruses, bacteria, rodents, etc.) across the farm. Disease prevention will only work with biosecurity, which is the cheapest, most effective option for disease control available.

In the mind of any veterinarian should be the fact that small backyard flocks pose a risk to the commercial poultry industry. This industry is a significant and vital part of the agricultural economy of the U.S and it is important that these flocks be protected from highly pathogenic diseases. Backyard flocks if not properly managed, might significantly increase the probability of disease exposure to the commercial industry. Diseases such as exotic Newcastle disease (END) and high pathogenic avian influenza (AI) can occur in the small flock poultry community. Either of these diseases would have devastating economic consequences to the commercial poultry industry.

Biosecurity has three major principles: access management; animal health management; and operational management. Access management refers to how you control the movement of animals, people, and equipment. Isolation or confinement of animals within a controlled environment is one way to do this. A fence keeps your birds in, but it also keeps other animals out. Separating birds by age group is also a very practical approach. If possible, the best approach is to maintain a "closed" flock. Practice all in all out if possible. If not practical, keep as much separation between older and younger birds as possible.

Animal health management refers to how one manages animal movements, observes animals for clinical signs of disease, and establishes response plans for potential disease situations. Practicing good record keeping, planning how animals will be introduced and removed from a farm, and working with a local veterinarian to establish a client patient relationship are examples. Avoid exposing a flock to any other avian species. Poultry swaps, flea markets, and shows are prime examples of how birds can become exposed to disease agents from other birds. Also consider this if you commonly see avian species at your veterinary clinic, as many poultry diseases are contagious to other avian species, as well.

Operational management refers to how a farmer maintains their facilities, incorporates cleaning and disinfection of equipment and facilities, establishes a bird disposal plan for mortality, manages manure, etc... Remove old litter and feed from buildings between flocks. Thorough cleaning of facilities and equipment is a best practice. Examples of good disinfectant agents are: Quaternary ammonium compounds, Iodophor (organic iodine), Chlorine (hypochlorites), & Phenolics. Remember organic matter must be removed before disinfection will work. If possible, rest facilities at least 2-4 weeks between flocks. Summer heat will also help to heat kill infectious organisms. Proper rodent and varmint control is also an essential component of operational management. Rodents can be an unseen

problem. They spread disease and can cause significant damage. A continuous rodent control program is necessary. Skunks, raccoons, foxes, pets, and opossums can also serve as vectors of disease and should be minimized.

Infectious diseases can be spread from farm to farm by: sick birds; carrier birds; fomites; carcasses; feed/water; pests, insects, rodents, wild animals, and birds; vehicles; hatching equipment and facilities; egg transmission; air-borne material; and contaminated premises through organic matter (feces, feathers, soils, litter material).

Disease prevention:
Various levels of biosecurity may be necessary depending on the farm situation. Practicality must also be considered, and economics are always a factor. In addition, not all farms are at the same risk of disease introduction. In the end, a commonsense approach should always be taken. For example, the greatest risk to a flock is the introduction of new birds because their disease status may not be known. They may have an infection or be asymptomatic carriers of a disease and appear normal.

In situations where all in/all out management is not practical, at least the farmer should try to utilize separate pens or premise to isolate and quarantine new or sick birds from the general population. Isolation sites should be as far from the general population of birds as possible. A quarantine of at least 6 weeks is strongly suggested. Birds should be monitored for any signs of clinical disease. Diagnostic testing if desired should also be performed at this time. For example, serology can be used to screen for diseases such as *Mycoplasma*, of which birds can be silent carriers of.

Directing the flow of on-farm traffic from the youngest to the oldest birds is also a good practice to follow. Also, it is best to work the general population of birds first followed by the quarantined birds. Different equipment, feed utensils, and protective coverings/boots should also be used between the different populations to prevent the mechanical transfer of disease organisms from these materials. Utilization of a disinfectant footbath will help decrease pathogenic organisms, as well. Using some sort of hand disinfection between populations is also beneficial. Drinkers and feeders should be routinely cleaned and disinfected. Every farmer should also have some sort of rodent and pest control plan in place. Down time is also helpful (2w if possible), as desiccation and heat are very effective means to kill many disease-causing pathogens. Dead birds, as well as soiled litter, feed, and other materials should be properly disposed of via rendering, burning, burying, composting, or sending them to a sanitary landfill.

Respiratory Diseases of High Importance in Poultry

As an avian veterinarian, you need to recognize the signs of respiratory disease in poultry with special attention to two reportable diseases, highly pathogenic avian influenza (HPAI) and exotic New Castle disease (END). Many respiratory diseases present the same clinically, but if either of these diseases is suspected, do not attempt to investigate yourself, as state and federal regulatory offices must be notified immediately. Both diseases are foreign animal diseases and are reportable in all states to your state animal health official and your state's USDA/APHIS district office within 24 hours. If a farm must be depopulated due to a break with a foreign animal disease, all non-commercial facilities in participating states are 100% indemnified.

New Castle Disease:
New Castle Disease viruses are a group of viruses that comprise the serotype avian paramyxovirus-1 (APMV-1). In poultry, they are further divided based on their virulence into three distinct pathotypes: lentogenic (mild to asymptomatic disease), mesogenic (mild to moderate disease) and velogenic (severe disease). Velogenic viruses can then be classified as either a neurotropic form (respiratory and neurologic signs), or a viscerotropic form (hemorrhagic intestinal lesions). Velogenic New Castle Disease is reportable if suspected in the U.S. APMV-1 viruses can infect many species but only some become sick. Lentogenic and mesogenic viruses are common in the United States and commercial poultry are routinely vaccinated for these viruses. Backyard poultry are not typically vaccinated in the U.S. Clinical signs vary depending on the pathotype but can include mortality; drop in egg production with soft or wrinkled shells; respiratory signs (lacrimation, coughing, snicking (similar to sneezing), dyspnea, nasal discharge); diarrhea; neurological signs (ataxia, paresis, paralysis, torticollis, circling); depression; anorexia; facial swelling or cyanosis of head, comb, wattles or legs $\pm$ dark skin from subcutaneous hemorrhages; conjunctivitis; hemorrhagic intestinal lesions. New Castle disease can cause conjunctivitis in people.

Transmission is via contact with infected feces or respiratory secretions and incubation is 2-15 days in chickens. Contact state and federal agents immediately if velogenic New Castle Disease is suspected, and do not attempt to diagnose. Diagnosis of lentogenic and mesogenic virues can be accomplished via virus isolation or PCR techniques in the laboratory through tracheal or cloacal swabs, tissue, or intestinal samples from affected birds.

Exotic Avian Influenza:
Avian influenza viruses are classified by pathogenicity into low pathogenicity (LPAI) and high pathogenicity (HPAI). LPAI viruses typically cause mild to no clinical signs whereas HPAI viruses can cause mortality rates close to 100%. All HPAI viruses must be reported to the OIE and have serious repercussions for international trade. AI viruses are classified into subtypes based on two surface antigens, the hemagglutinin (H) and neuraminidase (N) proteins. LPAI can carry any H protein from H1 to H16. Typically, the HPAI viruses have either H5 or H7 proteins. In addition, some H5 and H7 LPAI viruses can mutate to become HPAI viruses. Because of this, all H5 and H7 LPAI viruses must be reported and can affect international trade.

Avian influenza can be zoonotic and can cause anywhere from mild flue like symptoms to death in humans. Most cases in humans have resulted from very close contact with affected birds. The natural reservoir for LPAI is in wild birds, especially migratory fowl, and shore birds. Virus is shed in feces and respiratory secretions of infected birds and can also be found in meat and eggs in cases of HPAI. Incubation is 1-14 days, but HPAI typically kills within only a few days post infection. Clinical signs and diagnostics are indistinguishable from END. It is currently at the discretion of USDA chief veterinary officer whether vaccination for HPAI is allowed in the U.S.

Fowl Cholera:
Fowl Cholera is a contagious bacterial disease of domestic and wild birds caused by *Pasteurella multocida*. This organism is commonly carried asymptomatically in the saliva of many varmints (cats, rodents, skunks, possums, raccoons) where it can then be easily transmitted to domestic poultry. This organism typically causes a bacteremia with high morbidity and mortality. In the acute form, birds become febrile, anorectic, have ruffled feathers, depression, diarrhea, and sudden death. This disease can also have a chronic form where the organism localizes in the wattles, joints, lungs, and peritoneum of birds. Diagnosis is via blood culture and antibiotic treatment should be based on sensitivity results, as many infections are resistant to commonly used antibiotics. Vaccination is commonly used in commercial flocks.

Infectious coryza:
This disease is caused by the bacterium *Avibacterium paragallinarum*. This organism typically invades the upper respiratory system and sinuses. In chickens it causes facial swelling, and respiratory signs (lacrimation, nasal discharge, dypsnea, snicking). Accompanying nasal discharge is also commonly associated with a very pungent odor. Like with fowl cholera, this disease can be either acute or chronic. In acute cases, morbidity can reach 100% with moderate rapid mortality. Chronic carriers serve as potential reservoirs of infection for other birds. Diagnosis and treatment are based on culture and sensitivity.

Turkey coryza:
This disease is caused by the bacterium *Bordetella avium* and is an acute respiratory disease mainly of turkeys. Although all ages may be susceptible, adult birds commonly serve as asymptomatic chronically infected carriers of the disease and may readily infect younger naive poults (2-6w of age). It has a high morbidity but a low mortality unless it is complicated by secondary or other infections. It is transmitted via contaminated litter, feed and water. In young turkeys, disease often has an abrupt onset with nasal and ocular discharge, sneezing and snicking. Growth rate is reduced, birds are depressed and become anorectic. Tracheal rales may result and persist for several weeks. Lesions are confined to upper respiratory tract and include rhinitis and tracheitis. Histologically, the bacteria can be observed attached to the cillia of the respiratory tract. The organism can be readily cultured from the trachea. Improving husbandry is the best preventative/treatment for this disease.

Infectious laryngotracheitis virus (ILTV):
This is a respiratory herpes virus in chickens primarily, but other poultry species may be infected. Not only is there an acute phase of this disease, but birds can become carriers for long periods of time. Clinical signs can vary from mild to severe upper respiratory disease (gasping, lacrimation, coughing, wheezing, bloody exudate from trachea and oral cavity, facial swelling, high mortality, anorexia, decreased egg production). This disease can be devastating

to commercial poultry, and vaccination may be required. Diagnosis is based on necropsy examination with lesions primarily confined to the trachea (blood, mucous, caseous exudate) and eyelids (conjunctivitis), virus isolation, tissue culture, histopathology, and PCR analysis. Certain strains of ILT are reportable to officials and may impact trade so make sure to contact your State Animal Health Official. Strict biosecurity and quarantine of affected birds is necessary, and vaccination may only be approved by state officials in many states.

Mycoplasmosis:
There are many species of *Mycoplasma* that affect birds, but the most important in poultry include: *Mycoplasma gallisepticum (MG), M. synoviae (MS), M. meleagridis (MM) and M. iowae (MI*). *Mycoplasmas* are microorganisms that have properties of both bacteria and virues. *Mycoplasmas* are usually associated with respiratory infections but can also infect joints, and reproductive tract. In severe cases, clinical signs are like HPAI and END. Diagnostic tests are readily available to test backyard flocks and include ELISA, hemagglutination-inhibition (HI), isolation and identification, and molecular PCR analysis. Vaccination is used in commercial flocks but is regulated by officials in many states. These diseases are very common in backyard type poultry due to poor biosecurity practices by bird owners.

Infectious bronchitis (IB):
This coronavirus can cause respiratory signs like the previously mentioned diseases, as well as drops in egg production and egg quality, and can affect the kidneys of birds. Mortality rates often are age dependent with younger (< 3w) birds more severely affected. Diagnostics include ELISA, HI, and virus isolation. Certain strains of IB are reportable to officials. Vaccination is commonly used in commercial flocks but not in backyard type birds.

Regulatory Issues for Backyard Poultry

Legalities regarding treatment options:
Any poultry species is considered a potential food producing animal by the FDA even if only kept as a "pet". Because of this, the FDA has strict regulations regarding what medications can be used to treat these animals. If any vaccine, drug, or pesticide is administered to a poultry species, proper withdrawal times must also be established and provided to a client to avoid any potential food residues. In addition, when drugs are used via extra-label, use must follow the FDA's rules. These rules are stricter for food animals, including poultry pets. Valid veterinary client patient relationships must be established, proper records maintained, and withdrawal information for meat and eggs generated from scientific data available from animals treated with extra labeled drugs. The Food Animal Residue Avoidance Databank is available as a resource to veterinarians.

Drugs that are not allowed to be used via extra-label in poultry include: chloramphenicol; clenbuterol; diethylstilbestrol (DES); dimetridazole; ipronidazole; other nitroimidazoles; furazolidone; nitrofurazone; fluoroquinolones; glycopeptides; cephalosporins (not including cephapirin) in chickens or turkeys: for disease prevention purposes; at unapproved doses, frequencies, durations or routes of administration; or if the drug is not approved for that species and production class; adamantanes and neuraminidase inhibitors are approved for treating or preventing influenza A, but are prohibited from extra-label use in chickens, turkeys, and ducks. Compounding drugs is also strictly governed by the FDA and is not commonly done in poultry. Extra-label use of any medication in feed is also not allowed in food animals.

FDA Guidance for Industry (GFI) #209, The Judicious Use of Medically Important Antimicrobial Drugs in Food-Producing Animals, published April 13, 2012, discusses efforts to use medically important antimicrobials as judiciously as possible to minimize antimicrobial resistance development and preserve effectiveness in humans and animals. FDA has proposed two additional principles to address this issue: 1) The use of medically important antimicrobial drugs in food-producing animals should be limited to those uses that are considered necessary for assuring animal health. FDA considers the use of medically important antimicrobials in feed and water for production purposes an injudicious use; and 2) The use of medically important antimicrobial drugs in food-producing animals should be limited to those uses that include veterinary oversight or consultation. This information is discussed in GFI #209 and is available via a link below. The FDA also approves antibiotics for one of three marketing types: over the counter (OTC); veterinary prescription (Rx); and veterinary feed directive (VFD). FDA is suggesting voluntary compliance from drug sponsors to move from OTC use in feed to a VFD and OTC use in water

to Rx. The full details are described in Guidance for Industry (GFI) #213 released by FDA on Dec 12, 2013 and is available via a link below.

Animal drugs administered in or on animal feed require professional veterinary supervision, and are regulated by the FDA under the Veterinary Feed Directive (VFD). "FDA regulations in Title 21 Code of Federal Regulations (CFR), Part 558.3(b)(7) defines 'veterinary feed directive' as a written statement issued by a licensed veterinarian during the veterinarian's professional practice that orders the use of a VFD drug in or on an animal feed. This written statement authorizes the client to obtain and use the VFD drug in or on animal feed to treat the client's animals only in accordance with the directions for use approved or indexed by FDA. A veterinary feed directive is also referred to as a VFD order." Helpful links related to drug use in food animals include:

1. Animal Drugs @ FDA: http://www.accessdata.fda.gov/scripts/animaldrugsatfda/
2. Food Animal Residue Avoidance Databank: http://www.farad.org/eldu/prohibit.asp
3. 21 CFR 530: http://www.ecfr.gov
4. AMDUCA: https://www.avma.org/KB/Resources/Reference/Pages/AMDUCA.aspx
5. GFI #209: http://www.fda.gov
6. GFI #213: http://www.fda.gov/downloads/AnimalVeterinaryGuidanceComplianceEnforcement/GuidanceforIndustry/UCM299624.pdf
7. Veterinary Feed Directive: http://www.fda.gov

National Poultry Improvement Program (NPIP):
The NPIP is a voluntary partnership between the industry and State and Federal governments. Poultry producers have worked with USDA's Animal and Plant Health Inspection Service (APHIS) and various State governments and State Poultry Associations to create a system that has significantly reduced animal disease, improved animal, and human health, and created a continuing surveillance system for potential poultry health problems. Through the NPIP, poultry producers earn certain classifications for their products (eggs and/or birds) based on meeting specific management and disease testing requirements.

The NPIP began in 1935 initially started as a national effort to improve poultry production through testing for Pullorum disease (*Salmonella pullorum*). Fowl typhoid (*Salmonella Galinarum*) is like Pullorum Disease in transmission and clinical presentation and was added to the NPIP in 1954. These two diseases are what most backyard flocks are monitored for by program officials. Individual producers voluntarily participate in the Plan by enrolling with their Official State Agency (OSA). If a producer wants to ship poultry products across state lines, they must participate in the NPIP. To participate, a poultry producer must: request enrollment; demonstrate their facilities and procedures meet the required standards; maintain appropriate records; and complete the required diagnostic testing and monitoring of their birds, eggs, and facilities. Participants can choose to seek additional classifications and individual official state agencies may have more rigorous requirements than those found in the NPIP. Further information regarding NPIP, and state regulations can be found at:

1. NPIP: http://www.aphis.usda.gov/animal_health/animal_dis_spec/poultry/index.shtml
2. Official State Agencies: http://www.aphis.usda.gov

General References for Additional Information

1. Aiello SE and Moses MA, editors. The Merck veterinary manual [online]. Whitehouse Station, NJ: Merck and Co; 2012. Available through: http://www.merckmanuals.com
2. Swayne DE, Glisson JR, McDougald LR, et al. Diseases of Poultry. 13th ed. Ames, IA: John Wiley & Sons; 2013.
3. AVMA. Backyard Poultry Know the Legalities. Available through: https://www.avma.org.
4. AVMA. Educate Yourself about Backyard Poultry. Available through: https://www.avma.org.
5. United States Animal Health Association. Foreign Animal Diseases. Available through: http://www.aphis.usda.gov.
6. United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS). Available through: http://www.aphis.usda.gov.
7. USDA APHIS. Biosecurity for the Birds. Available through: http://www.aphis.usda.gov.