The Biosecurity Report

Understanding Biosecurity in Modern Poultry Operations

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Executive Summary

The marketplace of today is more global than ever before, and producers have greater opportunity to buy and sell agricultural commodities from around the world in this increasingly open trading forum. This level of openness also increases the exposure of worldwide producers to the costly effects of disease outbreaks, whether through the direct loss of flock productivity associated with disease outbreak or through trade restrictions and temporary loss of export markets based on the disease positive or negative status of a producer's flocks.

In 2006, avian influenza breached the heart of Europe, showing up in Germany, Italy, Austria and France. Shortly thereafter, India confirmed a case.[1] In 2004 a strain of highly-pathogenic avian influenza surfaced in Texas, forcing the destruction of over 400,000 birds and quarantines on hundreds of thousands more.[2] An outbreak of Exotic Newcastle Disease in the Western US resulted in the quarantining of 19,000 production sites for over two years.[3] Recent outbreaks of Foot and Mouth Disease in Korea were linked to farm workers getting clothing mailed to them from homes in China that were unwitting carriers for the disease. Proper biosecurity precautions could have minimized or eliminated these outbreaks.

Biosecurity is the prevention or control of pathogenic microorganisms from contacting animal or human populations. In the context of modern poultry production, it is essentially keeping the birds separate from the agents causing the disease. Used properly, biosecurity will also minimize the effect of disease and contain the spread of disease, if found. As such, biosecurity is first and foremost a management-based approach. Initial design of biosecurity policies and procedures should incorporate input from veterinarians, state agencies, and national guidelines. An understanding of the major diseases present today will aid the producer in crafting and understanding the biosecurity policy.

[1] Walsh, B. 2006. The Deadly Side Effects of Avian Flu. *Time Magazine* Feb 19

[2] Monke, J. 2004. Avian Influenza: Multiple Strains Cause Different Effects Worldwide. Congressional Report for Congress RS21747

[3] Kapczynski, D. R. and King, D. J. 2005. 'Protection of chickens against overt clinical disease and determination of viral shedding following vaccination with commercially available Newcastle disease virus vaccines upon challenge with highly virulent virus from the California 2002 exotic Newcastle disease outbreak.' *Vaccine* **23**: 3424-3433

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Chapter One:
Issue at Hand

Key Takeaways

- Modern confinement animal operations are susceptible to high economic costs from disease outbreaks due to the high concentration and genetic uniformity of animals present.
- There is a greater economic impact in today's global economy due to the loss of export markets occasioned by reportable disease outbreaks.
- Exotic Newcastle Disease, Salmonellosis, and Avian Influenza are three of the most concerning diseases from a cost and/or human safety standpoint.

Prior to the widespread adoption of modern confinement rearing practices, most poultry operations consisted of backyard flocks of varying domesticity and exhibited poorly-defined policies for monitoring and isolation of birds for disease prevention.[4] With backyard flocks are in close proximity to each other and people, diseases tended to spread rapidly during an outbreak and were often underreported due to poor government oversight and reporting practices.[5]

Modern farming practices have reduced the number of backyard poultry rearing operations through concentration of flocks into larger sizes and localized geographic areas, thus reducing the chance of organic spread of disease from direct transmission between neighboring domestic fowl sites. However these operations are more susceptible to significant economic loss from disease outbreaks than backyard flocks due to the uniformity of genetic stock present, concentration of birds in the rearing environment, and lower disease-resistance genes present in birds heavily selected for production traits only.[6]

Many economically important poultry diseases are not reliant on direct transmission between domestic fowl to spread, and are frequently transmitted by carriers such as wild fowl, ratites, psittacines, and passerines along with transmission via fecal material, nasal secretions, and fomites increasing the likelihood of transmission and creating potential reservoirs of disease that could survive long after an acute outbreak has been contained and resolved. Past major disease outbreaks in the US are estimated to have cost the poultry industry up to $5 billion dollars for a single incidence.[7] These costs are attributed to the depopulation of the affected areas, disruption in placement of chicks, additional costs of quarantine, disinfection, and inspection, and loss of major export markets due to disease status.

[4] Walsh, B. 2006. The Deadly Side Effects of Avian Flu. *Time Magazine* Feb 19
[5] *Idem*.

[6] Siwek, M. et al. 2010. 'A quantitative trait locus for a primary antibody response to keyhole limpet hemocyanin on chicken chromosome 14—Confirmation and candidate gene approach.' *Poult Sci* **89.9**:1850-1857

[7] Center for Food Security and Public Health. 2008. Newcastle Disease. Factsheet NEWC_A2008: 1

Major poultry diseases and their economic impact

Newcastle Disease: Newcastle disease is a viral disease of birds with a wide range of clinical signs from mild to severe, depending on the strain of virus causing the infection. Milder, lentogenic isolates of Newcastle disease are endemic in the United States and frequently cause symptoms including sneezing, coughing and rales. More severe symptoms may occur in flocks that are co-infected with other pathogens. Severe, velogenic isolates of Newcastle disease are endemic in Asia, the Middle East, Africa, Central and South America, and parts of Mexico.[8] Velogenic strains are commonly known as Exotic Newcastle Disease (END). Transmission of Newcastle disease is by inhalation or ingestion as affected birds shed virus in both feces and respiratory secretions. The virus is also present throughout the carcass of affected animals, and can be transmitted through ingestion of remains. Chickens usually only shed virus for 1-2 weeks, but other species of birds have been shown to sporadically shed virus for up to one year after infection. Chickens are particularly susceptible to END and may experience morbidity and mortality rates up to 100%, with vaccinated chicken flocks showing mortality rates between 30%-90%. Newcastle disease is zoonotic and presents in humans like conjunctivitis. Shedding of the virus occurs for 4-6 days in humans.

- In 2002-2003 a strain of Exotic Newcastle Disease (END) ran through the Western United States causing the death or destruction of more than three million birds and caused industry losses estimated at $5 billion.[9,10]

Avian Influenza: Avian Influenza (AI) is a virus of birds that affects wild birds and domestic poultry. Much like the flu for humans, there are many different types of differing severity. AI viruses are classified by a combination of two groups of proteins: the hemagglutinin or H proteins, of which there are 16 (H1-H16), and the neuraminidase or N proteins, of which there are nine (N1-N9). AI strains are also divided into two groups based upon the ability of the virus to produce disease in poultry: Low-pathogenicity AI (LPAI) and high-pathogenicity AI (HPAI). LPAI strains are endemic in all parts of the colonized world and generally are asymptomatic or only display minor symptoms in birds. HPAI is often fatal in birds, especially chickens and turkeys, and spreads rapidly.[11] The commonly known HPAI strain is H5N1. To date, only subtypes containing H5 or H7 have been highly pathogenic. These subtypes are also present in LPAI strains, and have been known to quickly mutate into HPAI strains. The USDA has a policy of eradication of all HPAI strains as well as all H5 and H7 LPAI strains detected in the US.[12] Some strains of HPAI are zoonotic and may be transmitted to humans through direct or indirect means. H5N1 strains that have infected humans are rare, but present with a mortality rate of 60%, making the monitoring and eradication of this disease a high priority worldwide. There has never been an outbreak of H5N1 in the US.[13] Symptoms of HPAI in poultry may include sudden massive die-offs, sometimes with no other symptoms present, respiratory distress, decreased water and feed consumption, ruffled

[8] *Ibid., p. 2.*
[9] *Ibid., p. 1.*
[10] Kapczynski, D. R. and King, D. J. 2005. 'Protection of chickens against overt clinical disease and determination of viral shedding following vaccination with commercially available Newcastle disease virus vaccines upon challenge with highly virulent virus from the California 2002 exotic Newcastle disease outbreak.' *Vaccine* **23**: 3424-3433
[11] USDA APHIS. 2006. National Poultry Improvement Plan: Seventy Years of Poultry Improvement. Program Aid No. 1857
[12] Center for Food Security and Public Health. 2010. High Pathogenicity Avian Influenza. Factsheet HPAI_H2010: 1
[13] National Chicken Council. 2007. www.nationalchickencouncil.com. FAQ

feathers, sinusitis, lacrimation, cyanosis of the head, comb and wattle, edema of the head, and green and white diarrhea. In addition, coughing and sneezing, blood-tinged oral and nasal discharges, neurological disease, decreased egg production and deformation of eggs may be present.[14]

- HPAI has been detected three times in US poultry: in 1924, 1983, and 2004. No human illness resulted from any of these outbreaks. The 1983-84 HPAI H5N2 outbreak resulted in humanely euthanizing approximately 17 million chickens, turkeys, and guinea fowl in Pennsylvania and Virginia[15] with a cost estimated at $65 million in federal funds and an additional $350 million in increased consumer costs[16]. This outbreak also caused retail egg prices to increase by more than 30%.[17]

Salmonella: Salmonella (named after USDA veterinarian Daniel E Salmon) are a family of bacteria that can cause Salmonellosis in poultry and humans. There are over 2,400 different serotypes of *Salmonella*, all of which are potentially pathogenic. The major serotypes of concern for poultry are *S. gallinarum* and *S. pullorum* which cause high mortality among poultry, and *S. enteritidis* and *S. typhimurium* which cause Salmonellosis food poisoning in humans. Pullorum disease is spread from infected parent stock to chicks through the egg, and results in a high number of dead-in-shell chicks and post-hatch deaths. Clinical signs are variable and non-specific, although presentations with diarrhea often include pasting of the vent. *S. gallinarum* causes Fowl Typhoid, an acute or chronic septicemic disease of adult chickens causing severe respiratory distress and depression culminating in sporadic mortality over a long period. Clinical signs usually include mucoid yellow diarrhea. Transmission is through feces and possibly the egg. The serotypes that cause Salmonellosis in humans usually present asymptomatically in chickens, who are carriers of the disease. It colonizes the intestinal and reproductive tracts and is transferred into the egg before the shell forms and also present in the carcass. Infected birds may shed intermittently for their entire life span. Lateral transmission is possible through the fecal oral route.

- The 2010 US outbreak of *Salmonella enteritidis* resulted in the recall of more than 500 million eggs and over 1,800 documented cases of food poisoning attributed to this outbreak.[18]

Mycoplasma diseases: Chronic Respiratory Disease (CRD), Infectious Synovitis (IS), M. meleagridis and M. iowae: CRD and IS are both caused by bacterium from the *Mycoplasma* family. CRD, or airsacculitis, is a long term disease of the respiratory system in poultry. It is caused by the bacterium *Mycoplasma gallisepticum* and usual onset follows stress challenges to otherwise healthy birds (debeaking, movement, ND outbreaks, etc.) CRD is spread from parent to offspring through the egg or by contact with airborne dust or droplets contaminated with the bacteria. Incubation is between four days and three weeks. Clinical signs of CRD infection include depression of appetite and respiratory distress in young birds, and congestion, sneezing and coughing in adult birds. In laying birds, a decrease of 20-30% in egg laying is common. Birds, once infected with CRD, will carry the disease-causing bacteria for the rest of their lives, making

[14] Center for Food Security and Public Health. 2010. High Pathogenicity Avian Influenza. Factsheet HPAI_H2010: 7
[15] USDA APHIS. 2006. National Poultry Improvement Plan: Seventy Years of Poultry Improvement. Program Aid No. 1857
[16] USDA FSIS. 2009. Disposition/Food Safety: Reportable and Foreign Animal Diseases. p. 22
[17] USDA APHIS. 2001. Highly Pathogenic Avian Influenza. Release.
[18] Ianelli, V. 2011. Egg Recall – 2010 FDA Egg Recall List. About.com

another outbreak possible anytime stressful conditions are present.[19] IS is caused by the bacterium *Mycoplasma synoviae* and is also transmitted from parent to egg and through contact with airborne dust or secretions from infected birds. Clinical signs may not be present, but can present as mild respiratory infections, swelling of the joints and breast blisters. *M. meleagridis* and *M. iowae* are more prevalent diseases among turkeys, and cause respiratory distress and wryneck.

- Most modern producers require proof of CRD- and IS-free birds as a condition of purchase. CRD and IS are reportable diseases in most US states.

There are many other diseases of poultry throughout the world with varying degrees of economic impact. The diseases referenced herein comprise the most pressing concerns for governments and producers worldwide with the highest potential to impact human safety and/or economies on a large scale. For more details on these and other diseases please see the references incorporated in this document.

[19] McMullin, P. 2004. Poultry Health and Disease. 5M Publishing ISBN 095301505X

Chapter Two:
Biosecurity

Key Takeaways

- Biosecurity is the policies and procedures put in place to prevent the transmission of infectious disease
- Most biosecurity is based on common sense approaches
- Disinfection is only possible once thorough cleaning has been accomplished

As producers grapple with the increasing influence of export markets and the greater travel of personnel and fomites worldwide, the need for protection of farms from sources of disease likewise increases. The key management tool at the modern producer's disposal is biosecurity. Biosecurity encompasses a broad range of management policies and procedures, but the essence of biosecurity involves producers doing everything in their power to reduce the chances of an infectious disease being carried onto their farms by people, animals, equipment, or vehicles. Most of the procedures involved in good biosecurity are based on common sense approaches to limiting the spread of disease and are very similar to actions already taken by the human populace everyday to reduce the transmission of human infectious diseases. The USDA has codified the main common sense measures applicable to the poultry industry.

USDA Common Sense Biosecurity Measures[20]

These items are mentioned in a number of government publications and are a good basis from which to build a comprehensive biosecurity policy:

- Keep Your Distance – Restrict access to property and livestock to prevent unauthorized entry. Post signs, maintain fencing, keep a visitor's log and only allow approved visitors entry when their presence is absolutely necessary. Have an area for visitors to change into clean clothes and footwear, disposable or farm-maintained. Ideally shower-in, shower-out facilities will be provided. Discourage handling of animals by all visitors. Require and teach biosecurity to family, employees, and all visitors coming into, or involved with livestock or production areas.
- Keep It Clean – Owners, staff, family and visitors should follow biosecurity practices for cleanliness. Wear clean clothes, scrub boots and shoes thoroughly with disinfectant and wash hands. Keep equipment and vehicles clean and insist that all machinery and vehicles must be cleaned before entering your property. Maintain programs to control birds and rodents that can carry and spread diseases.
- Don't Haul Disease Home – If you, your family, or employees have been on other farms, at feed lots, petting zoos, auctions, or other places where there is livestock and poultry, clean and disinfect your truck or car tires and equipment before going home. If you have shown livestock or birds at a fair or exhibition, or are bringing in new animals, keep them separated from the rest of your herd or flock for 30 days after the event. Always change clothes and wash your hands before returning to your animals.

[20] USDA APHIS. 2007. Biosecurity: Protecting Your Livestock and Poultry. Factsheet

- Don't Borrow Disease From Your Neighbor – Do not share equipment, tools, or other supplies with your neighbors or other livestock or poultry owners. If you do share these items be sure to clean and disinfect them before they reach your property.
- Look for Signs of Infectious Diseases – You should know what diseases are of concern for your herd or flock and be on the lookout for unusual signs or behavior, severe illness and/or sudden deaths. When possible, assess the health of your animals daily. Early detection is important to prevent the spread of disease.
- Report Sick Animals – Don't wait. Report serious or unusual animal health problems to your veterinarian, local extension office, or State or Federal animal health officials. USDA operates a toll-free hotline (1–866–536–7593) with veterinarians to help you. There is no charge for this service.

These general rules are good guidelines from which to develop a formal biosecurity policy for producers, tailored to individual needs and abilities. Another item to consider includes distance between production sites. While the exact distances pathogens can travel while airborne is not known, placing sites at least 1400 feet apart and ideally one mile apart is a good start to preventing airborne transmission from site to site.[21] Further guidelines can be found in the National Poultry Improvement Plan, published by the USDA.

NPIP Sanitation Procedures – Flock Sanitation[22]

To aid in the maintenance of healthy flocks, the following procedures should be practiced:

- Baby poultry should be started in a clean brooder house and maintained in constant isolation from older birds and other animals. Personnel that are in contact with older birds and other animals should take precautions, including disinfection of footwear and change of outer clothing, to prevent the introduction of infection through droppings that may adhere to the shoes, clothing, or hands.
- Range used for growing young stock should not have been used for poultry the preceding year. Where broods of different ages must be kept on the same farm, there should be complete depopulation of brooder houses and other premises following infection of such premises by any contagious disease.
- Poultry houses should be screened and proofed against free-flying birds. An active rodent eradication campaign is an essential part of the general sanitation program. The area adjacent to the poultry house should be kept free from accumulated manure, rubbish, and unnecessary equipment. Dogs, cats, sheep, cattle, horses, and swine should never have access to poultry operations. Visitors should not be admitted to poultry areas, and authorized personnel should take the necessary precautions to prevent the introduction of disease.
- Poultry houses and equipment should be thoroughly cleaned and disinfected prior to use for a new lot of birds. Feed and water containers should be situated where they cannot be contaminated by droppings and should be frequently cleaned and disinfected. Dropping boards or pits should be constructed so birds do not have access to the droppings.
- Replacement breeders should be housed at the proper density consistent with the type of building and locality and which will allow the litter to be maintained in a dry condition.

[21] Morrow, C. 2010. Biosecurity – an essential tool for modern poultry production. Article. www.thepoultrysite.com
[22] USDA NPIP. 2011. Title 9: Animals and Animal Products. Part 145: §147.21

Frequent stirring of the litter may be necessary to reduce excess moisture and prevent surface accumulation of droppings. Slat or wire floors should be constructed so as to permit free passage of droppings and to prevent the birds from coming in contact with the droppings. Nesting areas should be kept clean and, where appropriate, filled with clean nesting material.

- When an outbreak of disease occurs in a flock, dead or sick birds should be taken, by private carrier, to a diagnostic laboratory for complete examination. All Salmonella cultures isolated should be typed serologically, and complete records maintained by the laboratory as to types recovered from each flock within an area. Records on isolations and serological types should be made available to Official State Agencies or other animal disease control regulatory agencies in the respective States for follow up of foci of infection. Such information is necessary for the development of an effective Salmonella control program.
- Introduction of started or mature birds should be avoided to reduce the possible hazard of introducing infectious diseases. If birds are to be introduced, the health status of both the flock and introduced birds should be evaluated.
- In rearing broiler or replacement stock, a sound and adequate immunization program should be adopted. Since different geographic areas may require certain specific recommendations, the program recommended by the State experiment station or other State agencies should be followed.
- Feed, pelleted by heat process, should be fed to all age groups. Proper feed pelleting procedures can destroy many disease producing organisms contaminating feedstuffs.

NPIP Sanitation Procedures – Hatching Egg Sanitation[23]

Hatching eggs should be collected from the nests at frequent intervals and, to aid in the prevention of contamination with disease-causing organisms, the following practices should be observed:

- Cleaned and disinfected containers, such as egg flats, should be used in collecting the nest eggs for hatching. Egg handlers should thoroughly wash their hands with soap and water prior to and after egg collection. Clean outer garments should be worn.
- Dirty eggs should not be used for hatching purposes and should be collected in a separate container from the nest eggs. Slightly soiled nest eggs may be gently dry cleaned by hand.
- Hatching eggs should be stored in a designated egg room under conditions that will minimize egg sweating. The egg room walls, ceiling, floor, door, heater, and humidifier should be cleaned and disinfected after every egg pickup.
- The egg processing area should be cleaned and disinfected daily.
- Effective rodent and insect control programs should be implemented.
- The egg processing building or area should be designed, located, and constructed of such materials as to assure that proper egg sanitation procedures can be carried out, and that the building itself can be easily, effectively, and routinely sanitized.
- All vehicles used for transporting eggs or chicks/poults should be cleaned and disinfected after use.

[23] *Ibid.* §147.22

NPIP Sanitation Procedures – Hatchery Sanitation[24]

An effective program for the prevention and control of *Salmonella* and other infections should include the following measures:

- An effective hatchery sanitation program should be designed and implemented.
- The hatchery building should be arranged so that separate rooms are provided for each of the four operations: Egg receiving, incubation and hatching, chick/poult processing, and egg tray and hatching basket washing. Traffic and airflow patterns in the hatchery should be from clean areas to dirty areas (i.e. from egg room to chick/poult processing rooms) and should avoid tracking from dirty areas back into clean areas.
- The hatchery rooms, and tables, racks, and other equipment in them should be thoroughly cleaned and disinfected frequently. All hatchery wastes and offal should be burned or otherwise properly disposed of, and the containers used to remove such materials should be cleaned and sanitized after each use.
- The hatching compartments of incubators, including the hatching trays, should be thoroughly cleaned and disinfected after each hatch.
- Only clean eggs should be used for hatching purposes.
- Only new or cleaned and disinfected egg cases should be used for transportation of hatching eggs. Soiled egg case fillers should be destroyed.
- Day-old chicks, poults, or other newly hatched poultry should be distributed in clean, new boxes and new chick papers. All crates and vehicles used for transporting birds should be cleaned and disinfected after each use.

NPIP Sanitation Procedures – General Cleaning and Disinfecting[25]

The following procedures are recommended:

- In the poultry houses:
    - Remove all live "escaped" and dead birds from the building. Blow dust from equipment and other exposed surfaces. Empty the residual feed from the feed system and feed pans and remove it from the building. Disassemble feeding equipment and dump and scrape as needed to remove any and all feed cake and residue. Clean up spilled feed around the tank and clean out the tank. Rinse down and wash out the inside of the feed tank to decontaminate the surfaces and allow to dry.
    - Remove all litter and droppings to an isolated area where there is no opportunity for dissemination of any infectious disease organisms that may be present. Housing where poultry infected with a mycoplasmal disease were kept should remain closed for 7 days before removal of the litter.
    - Wash down the entire inside surfaces of the building and all the installed equipment such as curtains, ventilation ducts and openings, fans, fan housings and shutters, feeding equipment, watering equipment, etc. Use high pressure and high volume water spray (for example 200 pounds per square inch and 10 gallons per minute or more) to soak into and remove the dirt to decontaminate the building.

[24] *Ibid.* §147.23
[25] *Ibid.* §147.24

Scrub the walls, floors, and equipment with a hot soapy water solution. Rinse to remove soap.

- Spray with a disinfectant which is registered by the Environmental Protection Agency as germicidal, fungicidal, pseudomonocidal, and tuberculocidal, in accordance with the specifications for use, as shown on the label of such disinfectant.

- In the hatchers and hatchery rooms:
  - Use cleaning agents and sanitizers that are registered by the U.S. Environmental Protection Agency as germicidal, fungicidal, pseudomonocidal, and tuberculocidal. Use manufacturer's recommended dilution. Remove loose organic debris by sweeping, scraping, vacuuming, brushing, or scrubbing, or by hosing surface with high pressure water (for example 200 pounds per square inch and 10 gallons per minute or more). Remove trays and all controls and fans for separate cleaning. Use hot water (minimum water temperature of 140 °F) for cleaning hatching trays and chick separator equipment. Thoroughly wet the ceiling, walls, and floors with a stream of water, and then scrub with a hard bristle brush. Use a cleaner/sanitizer that can penetrate protein and fatty deposits. Allow the chemical to cling to treated surfaces at least 10 minutes before rinsing off. Manually scrub any remaining deposits of organic material until they are removed. Rinse until there is no longer any deposit on the walls, particularly near the fan opening, and apply disinfectant. Use a clean and sanitized squeegee to remove excess water, working down from ceilings to walls to floors and being careful not to recontaminate cleaned areas.
  - Replace the cleaned fans and controls. Replace the trays, preferably still wet from cleaning, and bring the incubator to normal operating temperature.
  - The hatcher should be fumigated or otherwise disinfected prior to the transfer of the eggs.
  - If the same machine is used for incubating and hatching, the entire machine should be cleaned after each hatch. A vacuum cleaner should be used to remove dust and down from the egg trays; then the entire machine should be vacuumed, mopped, and fumigated or otherwise sanitized.
- The egg and chick/poult delivery truck drivers and helpers should use the following good biosecurity practices while picking up eggs or delivering chicks/poults:
  - Spray truck tires thoroughly with disinfectant before leaving the main road and entering the farm driveway.
  - Put on sturdy, disposable plastic boots or clean rubber boots before getting out of the truck cab. Put on a clean smock or coveralls and a hairnet before entering the poultry house.
  - After loading eggs or unloading chicks/poults, remove the dirty smock/coveralls and place into plastic garbage bag before loading in the truck. Be sure to keep clean coveralls separate from dirty ones.
  - Reenter the cab of the truck and remove boots before placing feet onto floorboards. Remove hairnet and leave with disposable boots on farm.
  - Sanitize hands using appropriate hand sanitizer.
  - Return to the hatchery or go to the next farm and repeat the process.

NPIP Sanitation Procedures – Fumigation[26]

Fumigation may be used for sanitizing eggs and hatchery equipment or rooms as a part of a sanitation program. NPIP/APHIS/VAL-CO disclaims any liability in the use of formaldehyde for failure on the part of the user to adhere to the Occupational Safety and Health Administration (OSHA) standards for formaldehyde fumigation, published in the Dec. 4, 1987, Federal Register (52 FR 46168, Docket Nos. H–225, 225A, and 225B).

NPIP Sanitation Procedures – *Salmonella* and *Mycoplasma* Infections[27]

The following procedures are required for participation under the U.S. Sanitation Monitored, U.S. *M. Gallisepticum* Clean, U.S. *M. Synoviae* Clean, U.S. *S. Enteritidis* Monitored, and U.S. *S. Enteritidis* Clean classifications:

- Allow no visitors except under controlled conditions to minimize the introduction of *Salmonella* and *Mycoplasma*. Such conditions must be approved by the Official State Agency and the Service;
- Maintain breeder flocks on farms free from market birds and other domesticated fowl. Follow proper isolation procedures as approved by the Official State Agency;
- Dispose of all dead birds by locally approved methods.
- Avoid the introduction of *Salmonella*, *Mycoplasma gallisepticum*, or *Mycoplasma synoviae* infected poultry;
- Prevent indirect transmission from outside sources through contaminated equipment, footwear, clothing, vehicles, or other mechanical means;
- Provide adequate isolation of breeder flocks to avoid airborne transmission from infected flocks;
- Minimize contact of breeder flocks with free-flying birds;
- Establish a rodent control program to keep the rodent population and other pests under control;
- Tailor vaccination programs to needs of farm and area;
- Clean and disinfect equipment after each use;
- Provide clean footwear and provide an adequate security program;
- Clean and disinfect houses before introducing a new flock;
- Use clean, dry litter free of mold;
- Keep accurate records of death losses;
- Seek services of veterinary diagnostician if unaccountable mortality or signs of disease occur;
- Adopt and maintain a clean-egg program.
- Use only crates and vehicles that have been properly cleaned and disinfected to haul live poultry to and from the premises.

[26] *Ibid.* §147.25
[27] *Ibid.* §147.26

Conclusion

With increasing exposure to worldwide pathogens and higher economic value present in localized regions of confinement animal operations, it is imperative that modern producers take to heart biosecurity and implement it on their production sites. There exists no government oversight, worldwide organization, or medicinal company that can offer as much value to individual producers in the fight against disease as the producers themselves may through the careful implementation and adherence to strict biosecurity policies and procedures.