Master of Public Health Field Experience Report

BIOSECURITY FOR THE UPLAND GAMEBIRD PRODUCER

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Summary

Biosecurity practices are an important epidemiologic method for any producer to implement. Having sound practices in place can help significantly reduce the risk of disease transmission and incurring death loss in a producer's flock. Avian Influenza can not only devastate a producer, but also greatly impact the U.S. and global economies. Interventions such as placing footbaths in front of each entrance to a building or pen on the property, proper disposal of dead animals, prompt picking up of spilled feed, and proper litter management all contribute to the health of the animals and success of a producer.

Highly Pathogenic Avian Influenza causes very sudden death in the infected bird populations. Not only is this a loss to the producer, but on large scales can also be an incredible loss to the country's bird populations and the U.S. economy. The 2014-2015 outbreak resulted in the death of millions of birds, a strained trading relationship with our trading partners, and an economic loss in the United States and globally.

With the help of the United States Department of Agriculture Animal and Plant Health Inspection Service, Veterinary Services, as well as the Kansas Department of Agriculture, Kansas upland gamebird producers were provided with the tools necessary to prevent disease from entering their farm, as well as a plan should disease make its way into their flocks. Biosecurity plans specific for each producer were created and given to the producers in hard copy and electronic forms for easy editing. In addition, each producer received a generic biosecurity template, the National Poultry Improvement Plan (NPIP) guidelines and audit form, and an introduction letter that explained everything provided to them and how to use it.

Subject Keywords: Biosecurity, Gamebirds, Poultry, Avian Influenza, USDA

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Chapter 1 - Field Experience Scope of Work

Influenza viruses are members of Orthomyxoviridae. They are single-stranded, enveloped RNA viruses. There are four primary genera of influenza viruses: Influenza A, Influenza B, Influenza C, Influenza D. Influenza B primarily infects only humans. Influenza C infects humans, pigs and dogs, while Influenza D infects cattle and pigs. However, Influenza A viruses infect humans, birds, and mammals, and are the cause of all flu pandemics. Influenza A type viruses have subtypes characterized by combinations of 18 different hemagglutinin and 11 different neuraminidase proteins. Hemagglutinin is responsible for virus entry into host cells, has a high rate of mutation, and is the target of vaccination. Neuraminidase is responsible for the virus release from host cells, and is the target of antivirals like Tamiflu, a neuraminidase inhibitor (*Niederwerder*). All subtypes are found in birds except H17N10 and H18N11 (*Influenza*).

Avian Influenza (AI) is an Influenza A type virus. The natural reservoir of the virus is aquatic birds like ducks and geese, but can infect poultry, pet birds, wildlife birds, and zoo birds. AI subtypes are characterized by 16 different hemagglutinin and 9 different neuraminidase proteins. There are two forms of avian influenza classified by the pathogenicity of the strain. Low pathogenicity AI encompasses most of the AI viruses seen and can be subclinical, or produce clinical signs such as respiratory signs and decreased egg production. Highly pathogenic AI (HPAI) is also known as the fowl plague. It is a result of mutations in the H5 and H7 low pathogenicity viruses. HPAI cause severe disease with high mortality and sudden death in the bird populations. Transmission is through inhalation or ingestions of feces or respiratory secretions. Situations in which a lot of birds are in close contact, such as major commercial poultry operations, are particularly at risk of spreading the disease quickly. Biosecurity practices are extremely important in preventing farm to farm transmission, as well as protecting against any zoonotic potential (*Niederwerder*).

From December 2014 through June 2015, the U.S. poultry industry (turkeys and chickens) went through its largest animal health emergency to date. Highly pathogenic Avian Influenza was detected in 211 commercial flocks and 21 backyard flocks (*HPAI*). A total of over 50 million birds were effected in 15 states. The majority of the cases

occurred in the Midwest states of Minnesota and Iowa with 110 and 77 cases confirmed respectfully (*2014*). The birds affected represent 12% of the United States table-egg laying population and 8% of the total number of turkeys raised for meat (*Ramos*).

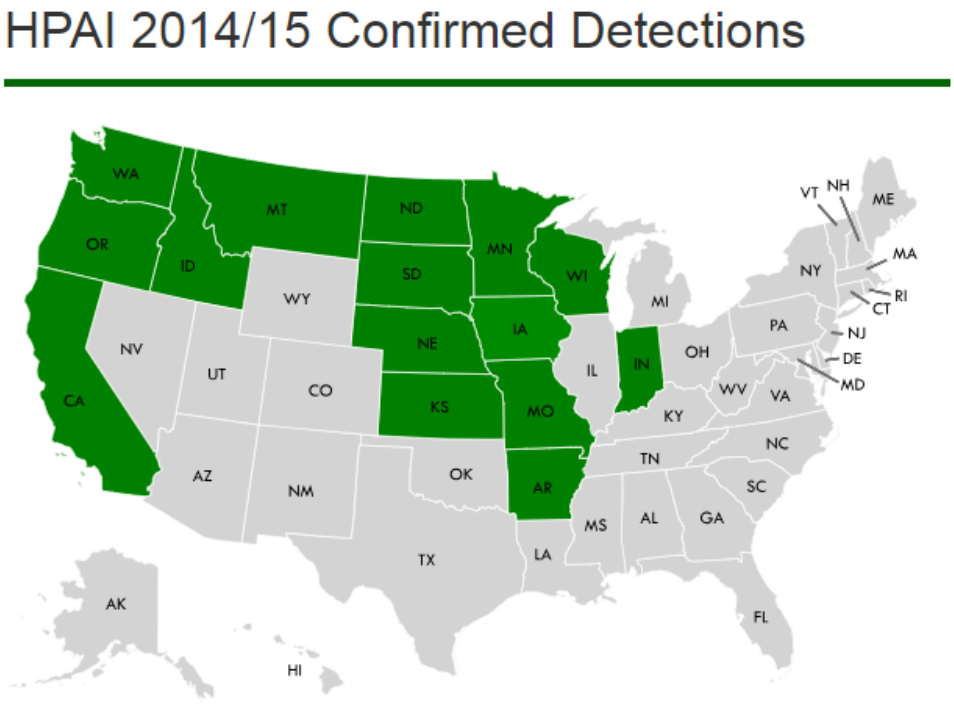

Figure 1.1 States with Confirmed HPAI Detections

A large amount of U.S. poultry is typically exported, but with the massive death loss from the 2015 AI outbreak, supply was incredibly depleted. Trade restrictions in foreign markets decreased demand for U.S. poultry as well. The lower supply additionally led to increased cost of goods and a greater reduction in production volume. The export losses for broilers contributed to the most loss of export income. According to the Foreign Agricultural Service, “in 2015, broiler exports were $1.1 billion lower than in 2014, a 26-percent decrease; egg export income declined $41 million, a loss of 13 percent; turkey export income was $177 million lower, a 23-percent decline” (FAS, 2016).

Most of the cases of HPAI were observed along the Central and Mississippi flyways used by wild birds during migration (Figure 1.2). Migrating waterfowl are believed to have been the initial cause of the HPAI outbreak in 2015 by introducing

HPAI strains into the domestic bird populations. While waterfowl may be to blame for the initial start of the outbreak, other factors such as sharing of equipment, fomites, and improperly disinfected employee clothing are also at fault for the propagation of the infections. By implementing stringent biosecurity practices, the risk of disease transmission between farms decreases drastically. The development of a biosecurity plan also provides an avenue to develop a plan of action should an outbreak be present in the area or on the farm. It is our hope that by providing poultry producers with biosecurity plans, they will have the tools necessary to prevent fatal disease in their flocks. (*Ramos*).

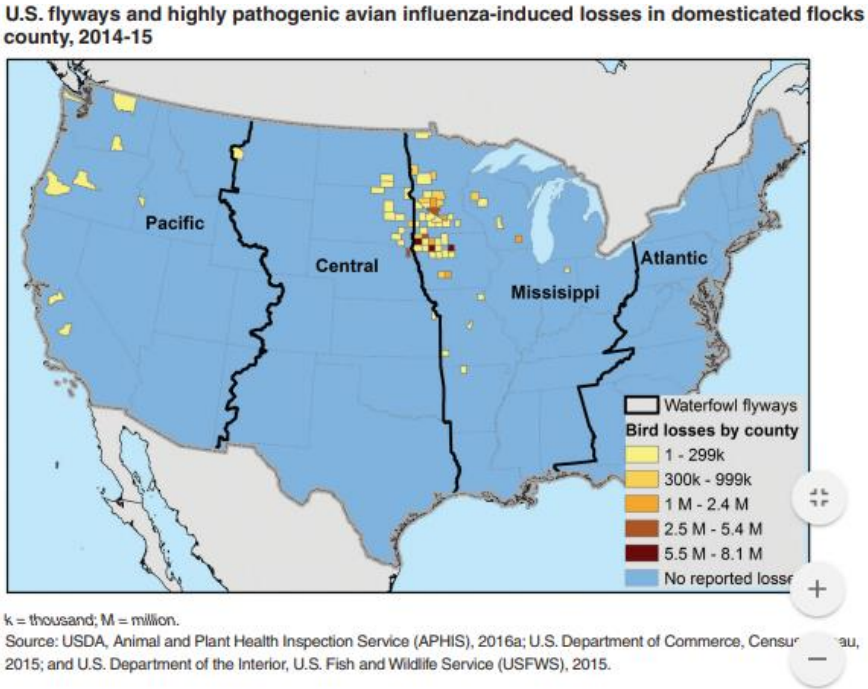

Figure 1.2 Losses by County and U.S. Waterfowl Flyways

Another major concern of Avian Influenza is the zoonotic potential. While rare, zoonosis is possible via inhalation or ingestion of infected saliva, mucous, or feces from birds. Clinical signs in humans include conjunctivitis, influenza-like illness, nausea, abdominal pain, and neurologic changes such as seizures. Diagnosis is made by taking a swab of the upper respiratory tract and running molecular tests like Polymerase Chain Reaction (PCR) (*Influenza*). Most of the clinical cases in humans result from one of two strains: Asian lineage H5N1, a highly pathogenic strain, and H7N9, a low pathogenic

strain. In recent years, the H7N9 LPAI strain has been the cause of human influenza outbreaks in China, where it is also prevalent in poultry (*The*). This strain has evolved into a partial highly pathogenic form, and is able to resist treatments like Tamiflu, a neuraminidase inhibitor. China has seen six Asian H7N9 epidemics to date, with a total of 1565 reported human infections and a 39% mortality rate. There has not been evidence of sustained person-to-person transmission, but this strain of avian influenza is rated “as having the greatest potential to cause a pandemic” by the CDC’s Influenza Risk Assessment Tool (*The*).

Another aspect of the strain that threatens public health is that this is the first strain of the influenza virus that can spread among and is lethal in ferrets (*Lisa*). In a study conducted by a team led by Dr. Yoshihiro Kawaoka at the University of Wisconsin-Madison, not only was it found that ferrets can be infected by the H7N9 Asian lineage virus, but that transmission is also thought to be airborne. The threat of the H7N9 strain on global health is immense, and the world is lacking in pandemic preparedness. If an H7N9 pandemic occurs, the results could be devastating.

The incubation period for the Asian lineage H5N1 HPAI is typically 5 days, but can be variable up to 17 days. This strain usually causes severe clinical illness in those infected, with symptoms ranging from respiratory “flu-like” symptoms, to mucosal bleeding and gastrointestinal illness. Once clinical illness has developed, the progression of more serious complications is rapid. Common problems seen in later stages of the illness are heart failure, kidney disease, and encephalitis. With the growing popularity of backyard chicken flocks, humans are increasingly at risk of acquiring disease from their birds (*The*).

The virus is transmitted through respiratory secretions and feces of infected birds. The viral load shed in the feces of waterfowl is larger than that shed in the feces of other birds, leading to the important consideration of migrating ducks and geese. In gamebird production for example, the gamebirds spend a significant amount of their life in netted open air flight pens. Infected migrating birds flying overhead could defecate into the flight pen, thus exposing all gamebirds in the pen via the fecal-oral route of transmission. Once avian influenza enters that gamebird flock, transmission is rapid via fecal-oral and aerosols. Farm and production equipment can quickly become a fomite

and contribute to the further transmission of the virus. Any workers coming into contact with the infected birds are placed at risk for zoonosis via respiratory transmission. Person-to-person transmission of avian influenza, while rare, is also a possibility (*The*).

Survival of the virus in the environment is dependent upon several factors like sun exposure, humidity, and temperature. In general, the hotter the temperature and the longer the virus is exposed to sunlight, the less likelihood of the virus to survive in the environment. A wide range of disinfectants, like bleach and ethanol, are effective on avian influenza. Routine cleaning and disinfection of production tools and equipment, as well as employee clothing, is important to reduce the risk of disease transmission (*The*).

When considering the high morbidity and mortality of highly pathogenic avian influenza, as well as the zoonotic potential, it is important to establish sound preventive measures. Disinfections, avoiding contact with sick or infected animals, washing hands, wearing personal protective equipment, wearing boots designated for certain areas only in those locations, thoroughly cooking all poultry products, not allowing employees to own or work with other poultry, prompt cleaning of spilled food, proper removal of spent litter, and proper disposal of dead birds are all protective measures that should be considered in preparing biosecurity plans for poultry producers (*The*).

The United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS) was created in 1972, consolidating the many divisions within the USDA that had previously operated independently of one another. With the mission “to protect the health and value of American agriculture and natural resources” (*About*), the efforts of APHIS are a continual job. APHIS is responsible for implementing emergency protocols and response strategies if a disease of concern is detected. The scope of APHIS has expanded with the growing needs of the American public, but the main goal will always remain to protect and promote U.S. agriculture (*About)*.

The scope of work completed during this Field Experience project follows closely with the normal expected duties of a Field Service Veterinarian with the United States Department of Agriculture Animal and Plant Health Inspection Service and the Kansas Department of Agriculture. This involved visiting livestock markets, slaughterhouses, feedlots, poultry producers, accreditation meetings, and USDA trainings. Most of the time was spent in Kansas, District 5. My primary mentor was Dr. LewAnn Schneider

with USDA APHIS, with some additional time spent with Dr. Paul Grossdidier of KDA, Dr. Kim Kirchum of USDA APHIS and Dr. Cody Garten of USDA APHIS. Through working with both the state and federal levels of government, I was able to see the large number of similarities between the organizations, as well as the vast amount of cooperation exhibited both daily and in the face of an outbreak. Through my experience, I was able to learn the process of developing a biosecurity plan for poultry producers. I was able to appreciate the practical challenges associated with developing and implementing a successful plan for diseases such as Highly Pathogenic Avian Influenza.

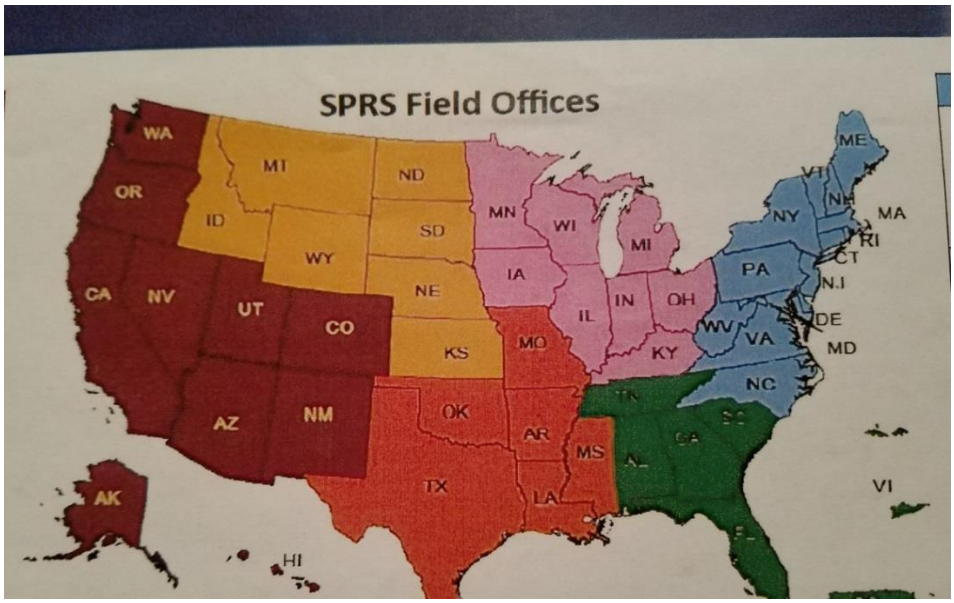

Figure 1.3 USDA APHIS District Map

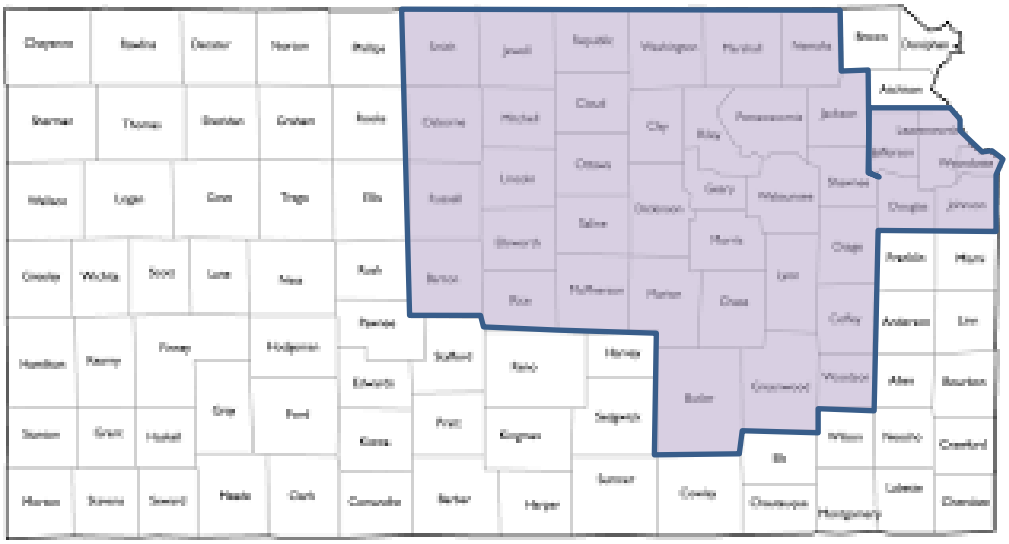

Figure 1.4 Kansas Areas Traveled

Chapter 2 - Objectives

Learning Objectives

1. Understand the scope of work for a Field Service Veterinarian
2. Understand the similarities and differences between the State and Federal levels of public health employment
3. Understand and appreciate the practical challenges of developing biosecurity protocols
4. Learn the process for developing and implementing different biosecurity protocols for various types of operations
5. Appreciate the importance of animal and plant health in the overall human and community health

Activities Performed

1. Attended regular meetings with USDA APHIS Field Veterinarian.
2. Attended scheduled training meetings with all USDA APHIS and Kansas Department of Agriculture agents, staff, and veterinarians.
3. Attended continuing education trainings, such as the CEEZAD and KSVDL workshop on *Diagnostics of Endemic and Emerging Diseases: Beyond the Status Quo*.
4. Became certified in the FEMA PER-333 course *Isolation and Quarantine Response Strategies in the Event of a Biological Disease Outbreak in Tribal Nations.*
5. Made regular visits to slaughterhouses, feedlots, poultry operations, zoos, accreditation meetings, and sale barns.
6. Tested chickens, pheasants and quail for Avian Influenza and *Salmonella pollorum* at private operations and county fairs.
7. The originally scheduled USDA Poultry Training in Lincoln, Nebraska was cancelled so that funds and personnel could be utilized for the Newcastle Disease outbreak in California.

Products Developed

1. A written report outlining and describing the extent of the field experience and capstone project.
2. An oral report outlining and describing the extent of the field experience and capstone project.
3. A poster was made and displayed at the annual meeting for the Kansas Upland Gamebird Producers detailing the National Poultry Improvement Plan (NPIP) principles.
4. A biosecurity template was created using the NPIP principles and is able to be used by any poultry producer. The template was approved by NPIP leaders. The template was provided to upland gamebird producers, and USDA APHIS and KDA Field Veterinarians. The template was also sent to Iowa State University Food Safety and Public Health for posting on their website.
5. Two biosecurity plans were created for Upland Gamebird Producers. Included in the plan were the personalized practices for each producer, example charts and ways for collecting and keeping necessary information for audits, helpful biosecurity information, and a jump drive with all information in an electronic form.

Chapter 3 - Capstone Project

As part of my Field Experience, a capstone project was completed. This project involved creating biosecurity plans for upland gamebird producers. First steps included developing a template that could be used by any poultry producer. This template closely follows the National Poultry Improvement Plan (NPIP) audit guidelines, and has been approved by the NPIP. Upon first contact with an upland game bird producer, I used the template and sometimes a tour of the facilities in order to determine the biosecurity practices already in place, as well as the scope of the production. We discussed the size of the operation, the number of locations and/or buildings, whether or not employees were allowed contact with other birds, personal protective equipment provided, the use of footbaths and foot powder, the process of allowing visitors on the farm, pest and rodent control, lines of separation and perimeter buffer areas, the use of equipment, their source of water and feed, and what would happen in the event serious disease was present nearby and on the farm. It was important to make my time at each facility more of a conversation as opposed to an interview, as it allowed me to develop a positive relationship with the producer for myself, and for the individuals with the Kansas Department of Agriculture and the United States Department of Agriculture Animal and Plant Health Inspection Service who would be conducting follow-up audits in the years to come.

After each visit with the producer, I created their plan based on the information gathered from our conversation, and each producer had a draft to review within two weeks of the initial visit. Once the producer signed off on their plan, the final product was put together. Each producer was provided with a binder containing a copy of their approved biosecurity plan, the NPIP principles and audit form, and any other useful information all in page protector sheets. Additionally, each producer was given a jump drive with an electronic copy of all provided documents, along with the general template. This will allow the producer the autonomy in the future to make changes to their plan as necessary.

Biosecurity for gamebirds can be challenging and offer some unique considerations. Depending on the producer, different levels of biosecurity were

suggested or developed. Not every producer raised gamebirds as their primary source of income, and therefore some were not willing to commit substantial time and funds into protecting their flock. For example, if a producer was unwilling to commit to only using single-use disposable cardboard crates for bird transport, plastic crates that are disinfected and allowed to dry in the sun were suggested as an alternative. Plastic crates can still be fairly expensive, so if a producer was unwilling to purchase plastic but instead used wood crates, it was suggested that the wood crates be sealed with a paint or oil to make it more difficult for infectious material to soak into the wood, as well as allow for easier cleaning.

Additionally, gamebirds are at advanced risk over chickens housed in confinement of being exposed to disease from wild fowl. Gamebirds live part or most of their lives outside in flight pens that, while netted to limit escape, leave the birds vulnerable to contact with waterfowl flying overhead. There is no barrier to prevent infectious feces from entering the flight pens and exposing the gamebirds. While it is idealistically possible to place a clear roof over the netting, it is not always reasonable or financially possible.

Another challenge in creating a biosecurity plan is the maintenance and care of brush around the buildings and flight pens, and establishing a good perimeter buffer area outside of the line of separation. The line of separation is defined as the perimeter fencing of a flight pen or the wall of a building, and was denoted in the biosecurity plans as a red line. The perimeter buffer area is defined as the nearest road, area of unkempt brush, or building not associated with gamebird productions, and was denoted in the plans as a yellow line. The colors of the lines were to serve as an important visual cue for the producers, employees, and any visitors on the property. Yellow was used to serve as a warning or caution symbol for biosecurity practices, whereas red was used to say that the biosecurity practices stated in the plan should definitely be followed at all times within the line of separation. An example map showing the lines of separation and perimeter buffer areas is shown below.

Figure 3.1 Line of Separation and Perimeter Buffer Area

Keeping brush kempt and away from the buildings and flight pens decreases the number of rodents, pests and insects coming into close proximity to the birds. This is important because both rodents and insects can carry a wide array of diseases. Fly control is a factor that must also be considered because flies have been demonstrated to be mechanical vectors for avian influenza. Bait and rodent traps should be strategically placed in various locations throughout the premises and monitored routinely to make sure anything captured is removed promptly. One notable location to place traps is under or around feeding stations in the flight pens. A map of all known trap and bait locations was included in the completed biosecurity plan provided to the producer. An additional method of pest control that is challenging to implement and is not always feasible for every producer is burying the flight pen netting in the ground, then placing tin around the bottom of the pens. It was important to work with the producer and to assess their situation in order to suggest sound biosecurity practices that would be implemented.

None of these physical changes to the gamebird operations would be possible if the producers were unwilling or unmotivated to make it happen. It was a necessary challenge to present information regarding avian influenza, suggest methods to prevent disease transmission, as well as inspire the producers to sometimes make necessary changes in their daily business operations. Changing human behavior can be a tricky task. I have found that people will only change their behavior for the long-term when they truly want to change themselves. It was not enough for me to say that what I was suggesting was better than what they were currently doing. I needed to explain why my suggestion would be better suited to their circumstances and the health of their animals and people.

Implementing biosecurity practices helps protect the health of gamebirds, and in turn protects the health of humans and the community. If we can prevent gamebirds from becoming infected with avian influenza, we can help prevent its zoonotic potential. An additional method of limiting the zoonotic potential is to have methods in place to handle visitors. Limiting the number of people coming into contact with the birds is always a good idea, and knowing who is on the property and when is important. Keeping a log of everyone entering the premises, when they arrive and leave, and their

reason for being there is a simple way to not only control who is on the property, but also provides a list of who a producer may need to contact should a zoonotic disease be found on the farm. Providing personal protective equipment (PPE) for employees and visitors protects both the humans and the animals. A dedicated pair of boots for flight pens, gloves in the hatchery, or disposable masks are all good methods of protection. Placing footbaths or foot pans with disinfecting powder at the entrances of buildings and flight pens reduces the risk of carrying disease into the birds, as well as reduces the risk of transferring infectious material to other parts of the operations or off of the property.

There can be several challenges in the creation of a complete and effective biosecurity plan, from technical daily operations on the farm, to inspiring behavior change within the employees involved. All of these challenges were made easier for me when I started the conversation with the producer and created a positive foundational relationship. This positive relationship not only helped me be better able to communicate with producer and create a plan that suited their needs, but will also carry over in future years with the USDA and KDA employees.

Foundational Competencies

(Numbers below correspond with the numbers of the 22 Public Health Foundational Competencies)

Evidence-based Approaches to Public Health

1. Apply epidemiological methods to the breadth of settings and situations in public health practice
    a. Epidemiologic methods were used quite extensively throughout my field experience and capstone project. For instance, prevention of disease is considered a primary intervention and is exactly what a biosecurity plan aims for. Creating quality biosecurity plans involved not only thinking about biosecurity in the present in order to prevent introduction of disease into the facility, but also thinking in terms of an outbreak situation and what can be done in times of heightened risk. Every producer's operation is different and each producer has a certain amount of time and money they are willing to invest in their operation,

so it was necessary to adjust the biosecurity recommendations to the specific situation for each producer. It was necessary to consider the epidemiologic triad and the interactions between host, agent and environment when creating the plans. Every part of the biosecurity plans that were created acted to address certain aspects of HPAI epidemiology. Protecting against disease transmission is one of the aspects that biosecurity targets the most. Wearing gloves when working in the hatchery, wearing dedicated boots for flight pen work, placing footbaths at entrances to buildings and flight pens, disinfecting vehicle tires that leave and/or re-enter the property, cleaning wood or plastic crates after each use, having farm equipment specifically dedicated for work within the production, or not allowing employees to work with or raise avian species all work together to decrease the potential for transmission of the virus. It was important to think about not only the direct transmission that could occur from birds to humans working directly with the birds, but also transmission via fomites like work boots or vehicle tires. Insect control is a necessary intervention because of the potential for flies to act as mechanical vectors in avian influenza transmission. The biggest resistance I found when working with producers revolved around what types of crates and containers were being used for bird transport. Some producers raised birds that were released exclusively on their property for hunting. Others raised birds that were sold to companies and individuals both within the state, within the U.S, and overseas. Single-use cardboard crates offer the best protection against disease transmission because they are discarded after use and no other birds will have the chance of being exposed to potential illness in this way. Plastic crates are the next best option. While they are not single-use, the material is non-porous and allows for easy cleaning after each use. The riskiest and yet most common container used for bird transport on to and off of the operation were wood crates, both sealed and unsealed. Sealed wood crates

provide slightly better protection over unsealed because it makes the material less porous and easier to clean. Both the cardboard and plastic crates greatly increase the cost on the producer, which is why I was met with slight opposition in some cases. After I explained the risk of disease transmission and the potential for introducing illness into their flock and employees, they became more responsive. Because avian influenza is a Type A virus, it is susceptible to common cleaning solutions like bleach, and routine disinfection of tools and equipment will kill off any virus present on those objects. When thinking about the common reservoir for HPAI, waterfowl, it became a bit more challenging to create interventions that would prevent transmission from waterfowl to the gamebirds. Some producers do not allow their employees to hunt waterfowl so they will not bring in any disease to the gamebird operation. However, one producer I worked with specifically allowed a handful of employees to hunt the property with the hopes that the controlled hunting would decrease the wild bird population on the property and reduce the risk of disease transmission. These employees were required to use a separate vehicle for hunting purposes than they were allowed to drive to work. They were also required to shower before going to work, as well as wear clothing that had not been worn while hunting. Another method of decreasing the wild bird population around the gamebirds that some producers used was loud noises. Age segregation of the birds is another common method to assist with the gamebird's immunity, as well as decrease the risk of disease transmission from slightly older birds to chicks. In every operation I visited, the producers had separate locations for chicks, usually in an enclosed building. Not only did this allow for naïve animals to be separated from adult birds, but it also allowed for environmental stressors to be minimized. With chicks housed in buildings, keeping the birds warm with heat lamps becomes easier. Picking up spent litter is easier and occurs on a more regular basis.

Food and water delivery to the chicks is also made easier. All of these factors help the chicks develop their immune systems. Biosecurity practices allow for primary intervention at every point in the epidemiology disease triad.

Planning & Management to Promote Health

8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs
    a. In order to construct a complete biosecurity plan that was relevant to the individual producer, it was necessary to consider their specific situations. Not every producer raised upland gamebirds as their sole source of income. On the same note, each producer was able or willing to commit a certain amount of time or money to implement biosecurity practices. With the goal that the biosecurity plans developed would be effectively used by each producer, it was necessary to evaluate the level of commitment for each producer and to formulate a plan that fit their needs. I needed to consider human behavior patterns and thought processes in the way I suggested or described different practices to the producers. It was even sometimes necessary to incentivize the creation of a biosecurity plan altogether. If a producer was hesitant about implementing a biosecurity plan, I would explain the benefits of having a plan in place. For instance, I would let the producer know that a biosecurity plan that passes an audit is required for operations of 25,000 birds or more to qualify for indemnity should a disease like Highly Pathogenic Avian Influenza be present on the farm. For the producer, the idea of not only losing their birds to a disease like HPAI, but also all of the money invested into the birds, was terrifying. Knowing that a biosecurity plan could help them protect their investment and livelihood helped them commit to the process. During the initial conversation with the producer, it was also necessary to point out and compliment them on the biosecurity practices that they were already doing. This made suggesting room for improvements easier. When communicating with the producers and educating them on diseases like

HPAI and what can be done with biosecurity to protect their flock, it was necessary to speak in terms that they understood. Not everyone has the same educational background as I do, and not everyone understands what terms like ‘epidemiology’ or ‘zoonotic’ mean. Using laymen’s terms and knowing gamebird production terminology was necessary to establish a good relationship with the producers. That relationship stood as the foundation for their biosecurity plan and allowed for more effective exchange of ideas.

11. Select methods to evaluate public health programs
    a. After the producers were given their biosecurity plans, it was expected as part of the NPIP protocol that the plan would be audited for completeness and effectiveness. A complete biosecurity plan is one that looks at every part of a gamebird operation from its employees to where they buy their feed and their water source. It will consider how disease is transmitted, how certain diseases survive in the environment, the behavior of humans and animals, as well as host interactions. The plan should not only describe what should be done on a daily basis, but also at different levels of heightened risk, such as if HPAI has been detected in neighboring states, within the state, or on the farm. For poultry operations specifically, creating a plan that follows the NPIP guidelines will allow for a complete biosecurity plan. In other operations such as feedlot cattle or swine units, the NPIP guidelines can also serve as a guide for the general concepts that should be considered for each production. An effective biosecurity plan is largely one that is realistic and usable by the producer. Making the suggestions and putting top-notch biosecurity practices into the plan is nice in theory, but does not mean much if the producer is unwilling or unable to follow them. An effective plan must take into account the means of the producer while serving as an intervention in the spread of disease and protection from illness in both humans and animals. It was decided amongst KDA and USDA Field Veterinarians that within the first year of the plan’s implementation a “soft” audit would be done. This would be an

audit where non-compliance with the plan would not result in any negative repercussions, but instead would be used to guide the producers as to what they can do in the future to make sure they maintain compliant. The NPIP protocol states that a full audit should be done annually.

Communication

19. Communicate audience-appropriate public health content, both in writing and through oral presentation
    a. Over the course of the summer, I had the opportunity to speak with a variety of different audiences including USDA and KDA employees, feedlot employees, upland gamebird producers, and other veterinarians. It was necessary to remember that not everyone comes from the same educational background or knows every aspect of public health or biosecurity. When speaking with producers, I had to make sure I explained concepts using non-technical vocabulary. When presenting to a group of USDA APHIS and KDA employees, I was able to use more technical terms, but sometimes was not able to use specific gamebird production terms. The same held true when preparing the biosecurity plans and a poster presenting the NPIP principles to the Kansas Upland Gamebird Producers at their annual meeting. This poster was incredibly effective in explaining the foundational principles of the NPIP guidelines, and what they had to do with their individual biosecurity plans. When each producer received their biosecurity plan, it was expected that the producer, also named the biosecurity coordinator for their operation, would train their employees on the biosecurity practices in place. The employees not only needed to understand the practices in terms of what was expected from them as a part of their job, but also why the practices were put in place. When a person is able to connect the ‘what’ to the ‘why,’ the greater the chance of compliance because they better understand. For the biosecurity coordinator to be able to train their employees on the biosecurity practices, I needed to make sure that I explained their plan and each method of intervention to the producer in terms that they understood.

Accountability is also a great tool to ensure compliance with their training. In each biosecurity plan, a training record was included. It was expected that after the biosecurity coordinator at each facility trained an employee on the biosecurity plan, the employee would sign the form acknowledging their training. Having formal documentation of their training can help keep them accountable. An example of the documentation is shown below in Figure 3.2.

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

Figure 3.2 Training Documentation

I have also found that using pictures or other visual tactics is incredibly helpful in delivering the information, more so than words alone. When possible, I made an effort to provide examples with and without images for my suggestions and explanations when speaking with producers. Individuals are more likely to remember an example as opposed to a statement because they have something to relate the topic to and the situation becomes more meaningful.

Interprofessional Practice

21. Perform effectively on interprofessional teams
    a. The creation of my biosecurity plans for the producers relied heavily on being able to perform effectively on interprofessional teams. Upland gamebird production was something that I knew very little about, but needed to expand my understanding in order to communicate effectively with the producers. Effective communication was the key to having a successful positive relationship with the producers, as well as the USDA

and KDA veterinarians. Essentially, I was on a team with the producer and the USDA APHIS/ KDA veterinarians. We coordinated with each other to accomplish the common goal of developing an effective biosecurity plan.

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Appendix A - Biosecurity Plan Template

(Producer-specific title page included with product given to producer)

Contents

Property Map

Biosecurity Plan

I. General Information

a. Operator Name: Click here to enter text.
b. Farm Name: Click here to enter text.
c. Main Office Physical Address: Click here to enter text.
d. Mailing address: Click here to enter text.
e. Phone number: Click here to enter text.
f. Biosecurity Coordinator's Name: Click here to enter text.
    i. Responsibilities
        1. The Biosecurity Coordinator is to be a full-time employee or member of the LLC. This person will remain informed of the best management practices and attend formal biosecurity training when possible. The Biosecurity Coordinator is responsible for training and documentation of site-specific training for all production personnel and suppliers. Training is to be done at time of hire for all employees and at least one time during the calendar year thereafter for the duration of employment. Documentation is kept in the primary biosecurity plan binder (Appendix B). Training records should be kept for a minimum of 3 years.
        2. The biosecurity plan will be reviewed internally at least annually and revised as needed, especially during any time of a heightened risk of disease transmission or illness present on the property. Records of these reviews are kept in the primary biosecurity binder (Appendix C).
        3. The biosecurity plan will be made available to anyone who enters to enter text.

II. *General* Biosecurity Protocol

a. Employees
    i. What clothes should employees wear to work? Is clothing provided?
    ii. Regulations on employees working with other birds and having poultry at home, as well as hunting waterfowl.
    iii. Protocols for disinfecting shoes prior to entering pens and buildings
    iv. Are there areas of the farm where employees are not allowed to be?
    v. What types of personal protective equipment are provided for the employees?
b. Visitors
    i. Are visitors required to sign in upon arrival at the facility?

ii. Where are visitors allowed to go on the farm? Must they be accompanied by an employee?
iii. Are visitors required to follow established biosecurity practices?
iv. Where should visitor vehicles park?
v. What is the protocol for chick and adult bird pick up?

c. Animal Control
    i. What is done to control the wild bird population?
    ii. What is done to control rodents and insects?
        1. Reduce pest friendly environments
            a. Is trash and unwanted debris removed from the property in a timely manner?
            b. Are grass and weeds mowed or removed around buildings and flight pens?
        2. Feed management
            a. If feed is spilled, what is done with it?
            b. Is unused feed removed from feeders?
        3. Rodent control
            a. Are bait stations or live animal traps used? Where are they located?
            b. Is tin placed around the bottom of the flight pen fencing?
            c. Maps for the locations of baits and traps can be found in Appendix E.
        4. Insects
            a. What is done to control insects in the hatchery, incubator room and egg washing room?
    iii. Dead birds should be disposed of in a timely manner.
        1. How often are dead birds picked up?
        2. What is done with dead birds?
        3. Is mortality loss recorded?

d. Line of Separation & Perimeter Buffer Area
    i. Line of separation (LOS): On maps, this is defined as a red line.
    ii. Perimeter Buffer Area (PBA) for each location is defined by the nearest road, unkempt brush, or building not associated with (Facility Name). On maps, this is defined as a yellow line.
    iii. General biosecurity protocol must be followed by all employees and visitors prior to crossing the Line of Separation.
    iv. Building #1 – building name
        1. address
        2. Description of procedure to cross LOS.
        3. map of building with LOS and PBA

v. Building #2 – building name
    1. address
    2. Description of procedure to cross LOS.
    3. map of building with LOS and PBA
vi. Building #3 – building name
    1. address
    2. Description of procedure to cross LOS.
    3. map of building with LOS and PBA
vii. Flight Pens: The perimeter fencing of each flight pen serves as the line of separation for each pen. On maps, this is defined as a red line.
    1. address
    2. Description of procedure to cross LOS.
    3. map of building with LOS and PBA

e. Equipment
    i. Shipping containers
        1. What shipping containers are used for deliveries arriving at the facility?
        2. What shipping containers are used for delivering chicks to other facilities?
        3. What shipping containers are used for shipping adult birds?
    ii. Vehicles
        1. Are any vehicles used on the farm shared with other operations?
        2. Are delivery vehicles cleaned prior to returning to the facility?
f. Waste, Manure and Litter Management
    i. What is done at the end of the season when the flight pens are empty?
    ii. What is done with used litter and manure?
    iii. What is done with hatchery waste?
g. Replacement Poultry
    i. Is replacement poultry used on this farm?
    ii. Is replacement poultry sourced from NPIP flocks?
    iii. Is there a quarantine process for adult birds arriving at the facility?
h. Water Supplies
    i. Is rural or surface water used for drinking and cleaning water?
    ii. If surface water is used, is it treated to reduce the number of disease agents?
i. Feed and Replacement Litter
    i. Where is feed and replacement litter stored?
    ii. What is the protocol for feed and litter deliveries?
j. Elevated Morbidity or Mortality

i. In the case of elevated morbidity or mortality, notify the Biosecurity Coordinator immediately.
ii. In the event of illness in a pen, only employees assigned to that pen will be allowed into the pen to limit the spread of disease.
iii. Outside Resources:
1. Dr. Paul Grosdidier, Kansas NPIP Contact (785) 633-3638
2. Dr. LewAnn Schneider, APHIS VS (785) 207-2127

k. Auditing and Further Plan Review
i. The biosecurity plan should be reviewed annually, in the event of increased mortality and morbidity present on the farm, as well as during local disease outbreaks.
ii. Employees will be trained annually by reviewing the biosecurity plan. New hires will receive biosecurity training at time of hire.
iii. Records kept for auditing purposes include: training, monitoring records, any corrective actions taken, and any changes and records of plan review. Examples of such logs can be found in Appendix E.
iv. Training records should be kept for a minimum of 3 years. Invoices should be kept for a minimum of two years. Both forms of records can either be kept on paper or electronically, so long as they are easily accessible.

III. *Emergency* Biosecurity Protocol

a. In the event of a serious disease problem ***on the farm***:
i. Contact the Biosecurity Coordinator immediately.
ii. All vehicles, equipment, and clothing are quarantined to the farm. Nothing can leave one property location to go to another until given permission by proper regulatory authorities.
iii. No clients or visitors are allowed on premises.
iv. Immediately contact the state veterinarian's office or APHIS for further instructions.
v. In the event of a natural disaster or mass mortality, a section of property will be identified for a mass burial site.

b. Upon suspicion of a serious disease problem ***in the state of Kansas***, including but not limited to highly pathogenic avian influenza (HPAI), the following biosecurity measures will be put in place:
i. Personal Protective Equipment
1. Employees may be required to change into Thunder Country – provided clothing upon arrival at work. Employees would change out of provided clothing prior to leaving the property. Provided clothing will be washed on site.

2. Shoes worn into the hatchery must not be worn outside of the hatchery and need to be sprayed off with water and disinfected prior to entry.
    a. If exiting the hatchery at any point, shoes need to be sprayed again with water and disinfectant.
3. Disposable gloves will be worn when handling birds, including collection of dead birds. Gloves will be changed between barns and flight pens.

ii. Line of Separation
1. Foot pans with chlorine based disinfectant powder will be placed at all entrances to the hatchery, brooder barns, and flight pens. Any time personnel enter or exit a building or pen, personnel need to step in the foot pans.

iii. Vehicles that have gone to other poultry farms will be washed as soon as possible after delivery. Tires will be sprayed with disinfectant prior to return to farm.

Appendix A: Cleaning Procedures

I. The following three steps are to be followed where applicable for the time of year.
   a. Dry clean the building, including removal of all litter from previous flock
      i. Allow pens to sit idle exposed to sunlight and warm temperature if possible
   b. Wash down building and apply disinfectant
   c. Wash and disinfect all equipment within the building or pen

II. Building Cleanout and Disinfection
   a. Pre-clean
      i. Remove all feed from feeders, feedlines, and from feed tank
      ii. Remove all live and dead birds from the building and properly dispose
      iii. Cover all exposed electrical devices and sensors
      iv. Flush, clean, and disinfect water lines using hydrogen peroxide
      v. Remove equipment if necessary
   b. Clean
      i. Push out litter and sweep the floor
      ii. Brush free any debris from floor, wall, and ceiling
      iii. Load litter on truck, properly cover litter, and transport off site
      iv. Wash down all surfaces with high pressure water
         1. Ceiling, walls, feeders, water lines, curtains, feed tanks, floor, brooder stoves, inlets, fans, shutter, and fan boxes
         2. Pay close attention to cracks in the floor, corners, building seams and around posts
      v. Remove all excess debris and water caused by the wash down. Remove all litter, feathers, and organic debris
      vi. Clean and wash down area where litter was pushed out
      vii. Clean and wash entry way and services rooms
      viii. Allow area to dry before applying disinfectant
   c. Disinfection
      i. Using the approved disinfectant, spray all building surfaces and equipment, applying product per label instructions.
      ii. Close up building for 24 hours and allow disinfectant to dry
      iii. Rinse building surfaces with water if necessary
      iv. Ventilate building prior to entry

Appendix B: Training Documentation

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

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I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

I, _____, have received biosecurity training for Facility Name on this date, ___/____/____, by _____. Signature: _____

Appendix C: Biosecurity Plan Changes and Review

Record all changes and dates of review of the biosecurity plan here.

Date	Review/Changes Made	Signature

Appendix D: Emergency Contact List

State Veterinarian	Dr. Justin Smith, Animal Health Commissioner Dr. Paul Grosdidier, KS NPIP Contact	(785) 564-6601 (785) 633-3638
USDA APHIS Veterinarian	Dr. LewAnn Schneider	(785) 207-2127
Employees		
Feed Delivery Person		
Clientele		
Utility Companies		
Other Important Contacts		

Appendix E: Logs

PEST CONTROL LOG

Pest Control Logs			
Bait Station	**Date**	**Comments**	**Initials**
Traps	**Date**	**Comments**	**Initials**

RODENT BAIT AND TRAP MAPS

MORTALITY LOG

Mortality Records---Location: _____.		
Date Removed	**Numbers**	**Initials**

MANURE SPREADING LOG

Manure Spreading Log		
Date Spread	**Location Spread**	**Initials**

VISITOR LOG

Visitor Log				
Date	**Name**	**Reason for Visit**	**Time In**	**Time Out**

Appendix B - Biosecurity Plan Introduction Letter

Emily Farmer
3000 Tuttle Creek Blvd Lot 122, Manhattan, KS 66502
785.313.0904 | efarmer31@vet.ksu.edu
Wednesday, January 02, 2019

<Biosecurity Coordinator>

<Facility Name>

Dear <Name>,

I hope this letter finds you well. I wanted to write you briefly about the contents of this binder. First is your biosecurity plan. Please read through the plan and if you find that it accurately describes the day-to-day operations of the farm, please sign the agreement acknowledging the plan as yours. Next are the appendices. Appendix A contains general cleaning procedures for the buildings. Appendix B contains the training documentation where each employee, including the biosecurity coordinator, needs to sign acknowledging training over the procedures present in the biosecurity plan. These records need to be kept either on paper or electronically for three years. Appendix C is a log where any reviews and changes to the biosecurity plan should be documented. At a minimum, the plan needs to be reviewed once per year. An Emergency Contact List is present in Appendix D. This list should contain anyone pertinent that should be contacted in case of an emergency, and should be made available to any employee.

Various logs are present in Appendix E. The first is for rodent control. Any time bait stations are refilled or live animal traps are emptied, the activity should be noted on this log. Following the log is a map of the property for you to mark the approximate location of each bait and trap station. The next log is mortality log included for completeness and is only an example. The logs you currently keep work just fine. The next log is a Manure Spreading Log. Any time manure is spread on the fields or is taken off of the property, it should be noted in the log for disease traceability purposes. The last log is a Visitor's Log and should be filled out by any non-employee entering the property. After the logs are the National Poultry Improvement Plan (NPIP) guidelines and audit form. These are the guidelines that were used to make your biosecurity plan, and they will also be used to audit your practices every two years. Also included in the binder is a jump drive attached to a chicken

keychain. Everything printed in this binder is also on the jump drive to allow easy editing. All documents were created using a PC. If you require versions of all documents that are more compatible with a Mac, please let me know. Additionally, there is a generic biosecurity plan template on the drive.

I greatly appreciate the opportunity to be involved in the creation of your biosecurity plan. If you have any questions, concerns, changes or need clarification, please feel free to reach out at any time as I will continue to be a student at Kansas State until 2021 and will be more than happy to assist you.

Best,

Emily