POULTRY BIOSECURITY OFFICER INFORMATION MANUAL

September 15, 2015

USDA United States Department of Agriculture

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Table of Contents

Introduction 2

1. Biosecurity Officer 3

2. Training of Employees and Other Personnel 4

3. Line of Separation 5

4. Perimeter Buffer Area 6

5. Personnel 8

6. Wild Birds, Rodents and Insects 8

7. Equipment 10

8. Dead Bird Disposal 11

9. Manure and Litter Management 12

10. Replacement Poultry 13

11. Water Supplies 15

12. Feed and Replacement Litter 15

Figures 1 – 3: Examples of Perimeter Buffer Areas and Lines of Separation on Poultry Sites ... 16

Figures 4 – 5: Examples of the Danish Entry System 18

Appendix A: Heat Inactivation Studies for Avian Influenza 20

Appendix B: Additional Information on Cleaning and Decontamination 22

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Comments and Feedback

This document was developed quickly in order to be ready for a possible HPAI outbreak associated with fall migration. Comments and feedback are welcomed and may be sent to USDA NPIC and the CFSPH at ISU at the following website: http://poultrybiosecurity.org/contact-us

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Introduction

Highly pathogenic avian influenza (HPAI) affected over 200 poultry premises in the upper Midwest in spring 2015. The scope of the outbreak demonstrated that biosecurity practices for poultry facilities need to be strengthened to reduce the risk of future infections. To assist poultry producers in implementing stronger biosecurity plans, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) worked with State, academic, and industry experts to develop a biosecurity self-assessment checklist and this Poultry Biosecurity Officer Information Manual.

Biosecurity approaches fall into two categories. **Structural biosecurity** is built into the physical construction and maintenance of a facility. **Operational biosecurity** includes standard operating procedures (SOPs) and compliance with SOPs that minimize the chance of virus entering the poultry house. Major enhancements to structural biosecurity cannot be widely implemented by fall 2015; therefore, the recommendations in this document focus on enhancing operational biosecurity. Over the long term, poultry producers will need to consider both operational and structural biosecurity to reduce their overall risk of HPAI.

This document emphasizes the elements for improving biosecurity that are believed to be the most important based on the spring 2015 outbreak and that can be implemented quickly. While entrance of infected birds is the most obvious way a flock may become infected, based on expert opinion and recent experience, the highest risks for HPAI virus introduction are personnel who enter the poultry buildings, shared equipment and shared crews, procedures for disposal of dead birds, and manure management. These elements should be the highest priority in allocating training and resources for improved biosecurity for Fall 2015.

This document emphasizes three concepts that may be new to existing biosecurity plans and should be strongly considered for implementation in all commercial operations: a Biosecurity Officer, a Line of Separation for each building, and a Perimeter Buffer Area.

- The Biosecurity Officer should be an experienced poultry veterinarian or should consult with one. He or she is responsible for developing a site-specific biosecurity plan and training all personnel who enter the farm.
- The Perimeter Buffer Area (PBA) is the area around poultry production buildings which functions to reduce the infectious load around the buildings.
- The Line of Separation (LOS) is represented by the outside walls of the poultry house and functions to prevent poultry inside the building from becoming exposed to sources of the virus on the outside.

Establishing biosecurity lines on production sites can act as a barrier to prevent the transmission of HPAI virus to susceptible poultry. The location of these lines will vary depending on the layout of the site. APHIS urges producers to develop a site-specific plan to implement enhanced

operational biosecurity as soon as feasible, preferably by October 2015. Because effective biosecurity requires vigilance, producers should put a system in place to verify that biosecurity enhancements are being followed.

The biosecurity procedures recommended in this Manual should be implemented as part of normal operating procedures in the absence of HPAI detection in the region. If HPAI is detected, poultry production sites in a Control Area may be required to implement additional biosecurity procedures as directed by Incident Command.

This Poultry Biosecurity Officer Information Manual is organized around the sections in the Checklist for Self-Assessment of Enhanced Poultry Biosecurity. Please note that the Checklist assumes that HPAI infections are limited to animals. Additional special precautions will be needed if the virus infects people.

1. Biosecurity Officer

> Each production site (or integrated system) should have a Biosecurity Officer capable of designing and implementing effective biosecurity procedures. The Biosecurity Officer should be an experienced poultry veterinarian or should consult with one. He or she is responsible for developing a site-specific biosecurity plan and training all personnel who enter the farm. The Biosecurity Officer should have the authority to ensure compliance with biosecurity protocols and take corrective action as needed. He or she continuously adapts the plan and procedures to address changing risks.

The Biosecurity Officer should be an experienced poultry veterinarian or should consult with an experienced poultry veterinarian. The Biosecurity Officer should be familiar with the current structural and operational biosecurity of the production site (and integrated system, if applicable). Integrated systems may have a Biosecurity Officer for the system with a manager on each site responsible for ensuring that the biosecurity SOPs are followed. The Biosecurity Officer for a small independent producer may be the owner of the operation. This Manual is intended to assist the Biosecurity Officer in developing site-specific biosecurity plans and in training employees and other personnel who enter the site. The Biosecurity Officer may need to revise these materials or develop supplemental information to address specific sites or integrated systems.

2. Training of Employees and Other Personnel

The Biosecurity Officer ensures that farm employees, contract crews, truck drivers and service personnel are trained on site-specific biosecurity SOPs. Training materials should be provided in languages understood by employees. The site-specific biosecurity plans should be distributed to every employee, and training should be reviewed and documented to make sure every employee understands the concepts and procedures that apply to their area of responsibility.

Education

Achieving good compliance with biosecurity practices by farm personnel and visitors is an ongoing challenge for animal production facilities. Ideally, compliance with the biosecurity practices should become part of the culture of the facility. Poor compliance is usually related to lack of knowledge or comprehension. To address this, ensure that employees receive proper training and resource materials and that they understand each of the steps required for effective biosecurity. All new employees should receive comprehensive training before they begin work. Signs and specific instructions should be posted in appropriate areas along with maps of the facility. Tools that can be used to educate farm personnel and visitors include group training sessions and demonstrations of proper practices, one-on-one training sessions, interactive modules/animations through online training, narrated PowerPoints and videos, handouts/pamphlets/brochures, detailed pictures, and signage.

Communication

The Biosecurity Officer should continually emphasize the importance of the biosecurity practices for HPAI prevention. Communication of biosecurity is vital to any operation to protect the health of the poultry. Printed materials should be given to employees, consultants, and service personnel. These individuals should be given time to read the materials and encouraged to ask questions. Contract crews, service personnel, consultants and visitors should receive information about biosecurity expectations and site-specific practices prior to arrival at the facility. Biosecurity information should clearly explain biosecurity protocols and show the location of the Perimeter Buffer Area (PBA) and designated parking as well as show the entrance and the main office. Once in the PBA, detailed signage should show the Line of Separation (LOS) and procedures for crossing the LOS.

Reference:

- Vaillancourt J-P, Racicot M. On-farm biosecurity in the poultry industry and the human factor. In: Biosecurity: bridging the gap between science and compliance. Proceedings of the 46th Annual American Association of Swine Veterinarians Meeting; 2015 Feb 28–Mar 3. pp 11–18.

3. Line of Separation

An essential component for improved biosecurity is to implement a Line of Separation for each building. The walls of the poultry house normally form the Line of Separation and should separate poultry from potential sources of HPAI virus. The Line of Separation is a critical control point for preventing HPAI virus exposure of poultry. A plan must address how this line will be defined and defended for each poultry house or set of connected houses.

The Line of Separation (LOS) Concept

The Line of Separation (LOS) is established to isolate poultry from potential sources of HPAI infection. The LOS consists of the building walls separating the birds from the outside plus a marked line in the entry room to the poultry house. A site may have as many Lines of Separation as there are buildings. A group of buildings connected by enclosed walkways may all be within the same LOS. See Figures 1-3 for examples of how the LOS might be established.

- The LOS acts as a line of defense to protect the health of the birds housed within its walls.
- Each house or group of connected houses should establish a single, clearly marked entry crossing to the bird side of the LOS, allowing for better control of personnel and equipment crossing the LOS.
- Site-specific coveralls or clothing and footwear and also items to clean and disinfect equipment are provided at the LOS.
- The LOS should be clearly marked with tape or paint and have appropriate signage. A bench or other low physical barrier is recommended.
- A visitor logbook is maintained by the site manager/owner to record information about individuals who cross the LOS. Prior to crossing, visitors granted entrance must sign the Visitor Logbook. Information recorded should include names, address, phone numbers, reason for visit, identify when and where their last contact (within 3 days) with poultry occurred, and certify that they have showered and changed clothes since their last contact with poultry.
- The LOS excludes wildlife and other animals from crossing the LOS and contacting poultry. Barriers must be intact and maintained to keep wild birds, their feces and feathers out of the facility.

Crossing the LOS

Personnel should use a Biosecure Entry Procedure to cross the LOS. The minimum essential components for a Biosecure Entry Procedure are:

- An entry area to the poultry house that excludes poultry.
- A clearly marked line within the entry to cross to the bird side of the LOS.
- An area for personnel to remove their footwear and outer clothing prior to crossing the LOS.

- A sink with running water and soap or hand sanitizer and signage instructing employees to clean their hands.
- An area for personnel to put on house-specific coveralls and boots after crossing the LOS, taking care not to contaminate these house-specific coveralls and boots in the process.
- Note: Personal items, such as cell phones and jewelry should not cross the LOS
- Note: All equipment and supplies that cross the LOS must be cleaned and disinfected, or be from a known clean source. The use of only clean and disinfected equipment and supplies is essential to the Biosecure Entry Procedure.
- The same procedure will be followed in reverse when crossing back to the outside of the LOS.

The Danish Entry System is an example of a Biosecure Entry Procedure that has been used successfully. See Figures 4 and 5 for some examples. A video on the "The Danish Entry Principle" is available here: https://www.youtube.com/watch?v=N4NNkd_Kfqw.

Respecting the LOS

Respecting the LOS will reduce the chance of HPAI virus infecting the poultry onsite. By following specific biosecurity measures, employees reduce the risk of transmitting HPAI virus into the house. The Biosecurity Officer develops SOPs, trains the employees, and verifies compliance with the SOPs to ensure the LOS is respected (Vaillancourt, 2015), (OIE, 2015, http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_biosecu_poul_production.htm)

4. Perimeter Buffer Area

Biosecurity plans should incorporate the Perimeter Buffer Area concept, which is aimed at reducing virus entering and contaminating the production site. Complete exclusion is not possible but reducing virus load in the outside environment will reduce risk. The Perimeter Buffer Area should be clearly delineated and located so that personnel do not leave the buffer area in the course of their daily tasks — or if they do, they use a specified entrance.

The Perimeter Buffer Area (PBA) Concept

The Perimeter Buffer Area (PBA) is an outer control boundary set up around the poultry houses to keep vehicles, personnel and equipment which have not been cleaned and disinfected from contaminating areas near the poultry houses. The PBA should be set up so that nonessential vehicles do not enter the PBA and therefore do not need to be cleaned and disinfected each time they arrive at the site. Employees, visitors, truck drivers and service personnel should be trained and understand the purpose and boundaries of the PBA. They must understand the procedures to follow when entering and moving around the site.

See Figures 1-3 for examples of the PBA.

The PBA should have a boundary like a fence, flags or rope. In addition, the entire site should be secured by a fence or other barrier and locked gate or cable when no one is present. After entering the PBA, personnel who enter poultry buildings should not walk where off-site vehicles that have not been cleaned and disinfected have driven.

Vehicles

Vehicles will be handled differently depending on their purpose at the site.

- Vehicles entering the PBA (such as animal transport vehicles) must be cleaned and decontaminated (using either disinfectants or heat) before entering the PBA. If transporting live animals, they should have been cleaned and decontaminated before being loaded. Vehicle windows and doors should remain closed as much as possible and cab insect spray should be available if needed.
- Employees should be trained to monitor vehicle cleanliness to help ensure compliance.
- Personal vehicles of employees and visitors should be parked in a designated area outside the PBA.
- Vehicles which do not enter the PBA (such as feed trucks and parcel trucks) do not need to take any additional measures before coming onsite as long as they stay outside of the PBA.

Personnel

Individuals entering the PBA should avoid areas where vehicles that have not been cleaned and decontaminated have driven. Personnel (such as feed truck drivers and propane delivery personnel) who need to cross into the PBA to perform their duties should remain in their vehicles. If this is not possible, individuals should put on cleaned and disinfected footwear or new, disposable footwear and disposable gloves or apply hand sanitizer as they leave their vehicle within the PBA or as they cross into the PBA. Site management or the Biosecurity Officer is responsible for communicating this protocol to such personnel.

Equipment

Equipment such as skid loaders, trucks, etc., entering the PBA should be cleaned and decontaminated (using either disinfectants or heat) each time before entering the PBA.

Modifications to the PBA and or LOS may be needed temporarily for specific procedures such as moving poultry, equipment, manure or litter into or out of the house. A site-specific biosecure entry procedure should be defined for procedures that require a modified PBA or LOS.

5. Personnel

Personnel and their clothing/footwear may become contaminated by AI virus through a variety of activities and contacts when they are off-site. Showering and changing into clean clothes immediately prior to arriving at a poultry site, or upon arrival, will greatly reduce the risk of AI virus introduction. This would apply to anyone who will enter the perimeter buffer area or cross the line of separation at a minimum.

Activities and contacts which may result in personnel becoming contaminated with HPAI virus include: working at or visiting other poultry sites, hunting or contact with gamebirds or waterfowl, living with people who work at other poultry premises, visiting sites with backyard poultry or waterfowl, walking through areas contaminated with waterfowl feces, stopping at a gas station previously visited by rendering or poultry delivery trucks, etc. It is possible to reduce the potential for personnel to introduce HPAI virus by showering and changing into clean clothes and footwear immediately prior to or on arrival at a poultry site. Personnel should ensure that the inside of their vehicle is clean and has not become contaminated by soiled clothes or footwear. Personnel should be trained in and follow all SOPs for crossing the PBA and LOS before they arrive at the facility.

6. Wild Birds, Rodents and Insects

Poultry operations should have control measures to protect poultry from wild birds, their feces and their feathers. Rodent and insect control programs should be in place.

Wild Birds

Waterfowl are known to carry all influenza subtypes though they frequently do not become ill. Ducks, and mallards in particular, are excellent long distance carriers. Other infected small wild birds are also known risks for introduction of HPAI into a house.

Influenza virus is transmitted via the fecal-oral route in waterfowl. Virus is excreted into water, where it can survive for months at cool temperatures. Such contaminated water can spread infection. During annual waterfowl migrations, virus load in the water is increased because of the concentration of these wild birds.

Domestic poultry can be infected if they consume feed or water contaminated by wild bird feces. Feathers and contaminated dust can also carry HPAI virus and can contaminate the environment. Within a house, influenza virus spreads quickly through feeders, drinkers, manure, respiratory droplets and manure.

Rodents

HPAI viruses may also infect rodents, and they can be contaminated with HPAI viruses on their fur, feet, etc. Rodent control is an important part of influenza and other biosecurity plans.

Insects

Houseflies, darkling beetles and blowflies can also carry HPAI virus. While insects are hard to eliminate in the poultry production environment, control measures should be in place to discourage entry and prevent breeding.

Biosecurity Measures for Wild Birds, Rodents, Insects

Biosecurity measures that address wild birds, rodents, and insects fall into three categories: clean, exclude, and control.

Clean: General farm maintenance, sanitation and drainage are important because it reduces attraction of wild birds, rodents, and insects. Trash should be regularly removed and feed spills cleaned up immediately. Waste eggs and dead birds should be removed promptly. Manure and litter should be managed to keep moisture content low. Feed should be protected from wild birds, rodents, and insects during preparation, storage, and handling to prevent contamination (see sections 9 and 12). Remove standing water that may attract migratory waterfowl to the site.

Exclude: To prevent wild birds from entering a poultry house, doors, windows, and vents should be sealed or screened adequately to exclude birds, rodents and insects. Plastic or vinyl strips can be hung vertically in areas where people regularly move through to help exclude birds. To prevent roosting and nesting in nearby buildings, netting can be placed under rafters. Bird spikes can also be placed in areas where birds may nest.

Modifications to poultry houses can make rodent entry difficult and should be pursued when the opportunity arises. Holes larger than ¼ inch should be plugged with copper mesh or steel wool. Particularly vulnerable areas include those where pipes or wires enter poultry houses. Foundation and other cracks should be sealed with expanding foam. Grass or brush near poultry houses should be kept short. Building perimeters should be lined with gravel at least 2 feet wide and 6 inches deep to prevent burrowing.

Control: Waterfowl harassment programs may discourage birds from frequenting water near a poultry production site. Most waterfowl can be harassed without a permit, except during breeding season, by chasing, patrolling with dogs, noisemakers and use of decoys. The perimeter of open water can be fenced and a tight grid can be installed over water to make access difficult for birds (https://www.fws.gov/cno/conservation/MigratoryBirds/Waterfowlfinal.pdf).

For rodent control, many rodenticides (poison baits) are commercially available. Anticoagulants such as warfarin, or non-anticoagulants such as bromethalin and cholecalciferol, can be used. Rodenticides are manufactured in different formulations including pellets, cereal meal, seeds, wax blocks, and packets. Using a variety of formulations is often helpful as some work better in certain areas than others. Trapping rodents with snap traps, multiple-capture live traps, and glue boards is effective as an additional method of rodent control. . Traps should be placed in places that rodents frequent about 6–8 feet apart for mice, and 10–15 feet apart for rats (http://extension.entm.purdue.edu/publications/ADM-3.pdf). Contracting with a professional pest control company often provides the most effective solution.

Insect populations can be minimized using biological or chemical control programs. Biological control involves propagation of fly predators, such as the macrochelid mite and hister beetle, which can live in poultry manure. Chemical control consists of insecticide applications which may target larvae or adults. Chemical classes include pyrethroids, carbamates, organophosphates, and others; rotation of chemical control products is often beneficial and reduces the chance of developing resistance (https://www.uaex.edu/publications/pdf/FSA-7063.pdf). However, use of chemical controls may interfere with biological control methods. Combining the two methods should be pursued carefully for best results.

State and local regulations for controlling birds, insects, and rodents must be followed. Use of chemical control methods must follow all label directions and regulations to avoid contamination of poultry.

7. Equipment

Equipment should be effectively sanitized between uses. Sharing of equipment should be minimized.

Effective disinfection of equipment and vehicles requires thorough cleaning, application of an effective disinfectant, then allowing time for the disinfectant to kill the virus. This is very difficult, if not impossible in the winter in northern climates, or during rain or severe weather events unless conducted inside a building. The HPAI virus can survive indefinitely when frozen. Dry cleaning under these conditions is an alternative to water washing, although it may not be as effective. As long as the equipment/vehicle does not enter the PBA, and the LOS concept is enforced, the equipment or vehicle should not present a significant risk of virus introduction into a poultry house. Vehicles on the premises, but outside of the PBA, do not present a greater risk of introducing HPAI virus than a vehicle on a nearby public road. Therefore, it is not necessary to clean and disinfect vehicles that do not enter the PBA.

Equipment used on poultry production premises can serve as a means for disease spread or transfer. This includes any number of items used for the handling, care, treatment, or euthanasia of poultry, or any other items that may have had contact with infected poultry or entered poultry houses.

Sharing of specialized equipment that is used infrequently (e.g., manure handling equipment, decaking equipment, turkey or chicken loading equipment, spent hen removal equipment, pullet crates, etc.) between poultry sites presents a risk for virus spread.

Any equipment that crosses the PBA or LOS should be cleaned and decontaminated (using either disinfectants or heat) before crossing. It is difficult to completely clean and disinfect internal components of equipment and some disassembly or shield removal may be required. An alternative is to heat the equipment for a time and temperature that will inactivate the virus; 56^{o}C (133^{o}F) for three hours has been recommended:

References:

- Trampuz A, Prabuh RM, Smith TF, Baddour LM. Avian influenza: a new pandemic threat? Mayo Clin Proc. 2004;79:523–530. Available at: http://www.researchgate.net/profile/Andrej_Trampuz/publication/8635212_Avian_influenza_a_new_pandemic_threat/links/00b7d5259617291ea4000000.pdf;
- Kaoud HA. Effect of disinfectant on highly pathogenic avian influenza virus (H5N1) in lab and poultry farms. IJESIT 2013;2(5):144–149. Available at: http://www.ijesit.com/Volume%202/Issue%205/IJESIT201305_20.pdf;
- Twin Cities Advance Practice Center. Highly pathogenic avian influenza (HPAI), H5N1 waste management decision tree guidance document. 2007 Apr. Available at: http://www.health.state.mn.us/divs/eh/apc/prof/swmngmt/dtbackground.pdf

This time and temperature may be longer than necessary since other publications have demonstrated killing of HPAI viruses at 30 or 60 minutes (See Appendix A). Poultry facilities or operators of shared equipment should consider having a building dedicated to decontaminating equipment by water washing /disinfection of equipment under controlled conditions or heat treatment. The equipment could be cleaned, then placed in a heated building overnight with automatic controls to raise the temperature for a specified time (56ºC (133ºF) for three hours) then cool down. Research is needed to determine what temperature would be effective for overnight (8 to 10 hours) decontamination of equipment. Crews which operate the shared equipment should shower and change into clean clothes and footwear immediately before arriving at the poultry site, as previously described.

Whenever possible, facility-specific dedicated equipment should be used and equipment should not be shared unless absolutely necessary.

See Appendix B for additional information on cleaning and decontamination.

8. Dead Bird Disposal

Dead birds should be disposed of in a manner that prevents the attraction of wild birds, rodents and other animals and avoids the potential for cross-contamination with dead birds from other facilities.

Dead birds should be removed and placed in a closed, leak-proof container within the LOS during the day and the container removed daily. If the person crosses the LOS to deposit dead birds in a container, they should follow the SOPs for crossing the LOS to re-enter the house. The dead bird collection container should be located so that it can be emptied from outside the PBA (see Figures 1 and 2). If dead birds are disposed of on-site, the disposal site should be located outside of the PBA and the disposal method should be designed to prevent disease transmission. The truck or other equipment that collects and transports the dead birds off-site should remain outside of the PBA.

Personnel should assume that the truck that picks up dead birds could contaminate the dead bird collection container. Employees who deliver dead birds to the dead bird collection container

should always use the biosecure entry system when crossing the LOS to re-enter poultry houses, including changing of coveralls and footwear.

If re-usable containers (such as garbage cans) are used to transport dead birds to a dead bird collection container or disposal site, the re-usable containers from each house should be cleaned and disinfected before being returned to the house.

9. Manure and Litter Management

> Manure and spent litter should be removed in a manner to prevent exposure of susceptible poultry (either on or off the farm of origin) to disease agents.

Avian influenza virus has been shown to survive in poultry manure and litter for long periods of time, especially in cold weather. (Lu et al., 2003), Techniques for manure and litter management vary with the type of production system, physical characteristics of the site, and weather. For these reasons, it is very important for the Biosecurity Officer to develop site specific SOPs for manure and litter management for each poultry facility.

Changes to PBA and Controlled Access Point during Manure/Litter Removal

Buildings that have been emptied of birds at the end of a production cycle should be treated as being outside of the PBA in order for the necessary crews and equipment to repeatedly enter the building to remove birds and manure/litter. The LOS no longer applies to the house because there are no birds in the house to become infected. The PBA needs to be temporarily re-located including a Controlled Access Point so that the approach to that building and the inside of the building itself are outside of the PBA. If the building is connected to other buildings, efforts should be made to isolate the building, such as hanging plastic curtains to temporarily seal off the building from connected buildings. Personnel involved in manure removal must understand where they and their equipment are allowed to operate and areas where they are not allowed in order to minimize contamination. Other personnel on the site inside the PBA should avoid the building that is being emptied and the Controlled Access Point. After the building is emptied, cleaned, decontaminated (using disinfectants or heat) and restocked with birds, the LOS and PBA around the building need to be restored.

All vehicles, equipment, and personnel involved in manure removal and cleaning the building should enter only through the Controlled Access Point. Equipment to be used should be cleaned and decontaminated before arrival at the site; the Biosecurity Officer should develop site-specific SOPs for personnel involved in manure/litter management activities.

For laying facilities that remove manure to a separate building using a belt system, this building should be maintained as outside the LOS and the PBA. Trucks should follow designated routes if removing manure/litter from the premises. Multiple poultry farms should not share initial collection sites for manure/litter disposal, especially if dead poultry will be added to the manure/litter as a part of a composting process.

Cleaning and Decontamination of the Poultry House between Production Groups

In instances when manure/litter is completely removed from the poultry house, the poultry house will need to undergo complete cleaning and decontamination (using disinfectants or heat) before the introduction of new birds. In instances where manure/litter is re-used for the next production cycle, a modified cleaning and decontamination procedure may be used to prepare the building before restocking. The Biosecurity Officer should develop site-specific SOPs.

Re-establishing the LOS and PBA

After manure/litter removal is complete, the PBA and LOS will need to be decontaminated before becoming re-established in their original locations. Once the last manure handling vehicle leaves through the designated entry/exit, the building should be cleaned and decontaminated, the portion of the Controlled Access Point allowing entry into the building should be closed, and the LOS reinstituted as the building walls. After this occurs, the PBA must also be reinstated. This could be done by proper cleaning and disinfection of the Controlled Access Point if it is hard surfaced. If it is gravel or dirt other methods will be needed, such as application of quick lime or hydrated lime. Alternatively, covering the area with gravel/road rock, or a thick layer of agricultural lime, or allowing it to sit undisturbed for a period of time in warm weather is sufficient.

Reference:

- Lu H, Castro AE, Pennick K, Liu J, Yang Q, Dunn P, Weinstock D, Henzler D. Survival of avian influenza virus H7N2 in SPF chickens and their environments. Avian Dis. 2003;47(3):1015–21.

10. Replacement Poultry

It is not possible to prove that a bird or flock is free of HPAI virus; it is only possible to demonstrate lack of evidence of infection. Replacement poultry should come from sources with documented biosecurity practices and a history of freedom from HPAI infection. There should be recent surveillance testing on the source flock. Replacement birds should be transported in vehicles cleaned and disinfected appropriately to minimize the risk of HPAI transmission from previously transported birds.

Sourcing Replacement Poultry

When sourcing replacement poultry, request a copy of the hatchery/source farm's biosecurity protocols (OIE, 2015). Request information about the source farm's surveillance protocols (USDA, 2015). Replacement poultry should test negative for HPAI according to the NPIP H5/H7 Avian Influenza Monitored Flock requirements (a negative agent or antibody test within 21 days of movement). During an HPAI outbreak, testing according to the Secure Poultry Supply Plans may be requested: Two negative rRT-PCR tests at least 24 hours apart, with one negative test within 24 hours of movement.

The interior of the trailer used to move poultry should be cleaned, decontaminated (using disinfectants or heat) and allowed to dry prior to loading cages with poultry. Containers and equipment used for placement of poultry should be new or cleaned and decontaminated. Personnel loading or delivering poultry should wear site-specific clothing and personnel loading poultry cages into the trailer should wear site-specific clothing or should not enter the LOS.

Actions to Limit Disease Spread on Farm

When filling the house, aim for single source chicks/pullets for one building (avoid commingling).

After a house is stocked, new birds should not be introduced to replace early mortalities in order to keep the house fully stocked.

Chick/Pullet Delivery/Restocking

Minimize the risk of disease entry by ensuring personnel transporting birds in cages from the truck to the house do not contaminate their footwear, clothing, or hands outside the Line of Separation (LOS). Designate a controlled access point for birds in cages and personnel in protective footwear transporting cages/dollies to cross the LOS. Prior to bird load-in, if this area extends beyond the normal LOS, it should be cleaned and disinfected. The tractor/trailer carrying the birds should follow premises entry biosecurity protocols when entering the PBA. The trailer carrying the birds remains outside the LOS but the interior of the trailer and the path into the barn would be considered a Modified LOS. Because the cages on the trailer will be entering the farm, the outside of the cages and the floor of the trailer present a risk of introducing disease.

Personnel responsible for entering the trailer to transport birds in cages should wear task appropriate clothing and footwear. Personnel, birds, and cages should only cross the LOS at the controlled access point. Empty cages should either be disposed of in a safe manner or returned to the trailer and then cleaned and decontaminated before taken to another site. Once the delivery trailer leaves, the controlled access point to cross the LOS should be closed and the LOS reinstituted as the building walls. Clean and decontaminate as appropriate.

References:

- Ssematimba A1, Hagenaars TJ, de Wit JJ, Ruiterkamp F, Fabri TH, Stegeman JA, de Jong MC. Avian influenza transmission risks: analysis of biosecurity measures and contact structure in Dutch poultry farming. Prev Vet Med. 2013 Apr 1;109(1–2).
- USDA. HPAI Outbreak 2014-2015: Timeline, eligibility, and approval for restocking. 2015 Aug. Available at: http://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/criteriarestock.pdf
- OIE. Terrestrial Animal Health Code Chapter 6.4, Biosecurity procedures in poultry production. 2015 Jul. Available at: http://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/2010/chapitre_biosecu_poul_production.pdf

11. Water Supplies

> Water should come from deep wells or sources that have been treated to eliminate any potential contamination with live virus. If water comes from a surface water source, experts in water treatment should be consulted on how to continuously treat the water to eliminate viable virus.

Water is something that crosses the LOS daily. It may be used for drinking, cooling, or for washing and must be clean and free of disease agents. Avian influenza is carried by many wild waterfowl. They pass the virus in their feces and can easily contaminate surface water such as lakes, ponds, rivers, and streams. The virus can live for extended periods in water. Use of inadequately treated surface water is a proven source of avian influenza infection.

To ensure that water crossing the LOS is clean and free of disease, it should come from wells or sources that have been treated to eliminate any potential contamination with live AI virus. This applies to all water used inside the poultry buildings: for drinking, for cooling, or for washing.

If water comes from a surface water source, experts in water treatment should be consulted on how to continuously treat the water to eliminate viable virus (e.g., chlorination). Special procedures may be needed when using modified-live virus vaccines in treated water as the vaccines may be inactivated. Products are available for inactivating the chlorine in drinking water so that live vaccines can be given.

12. Feed and Replacement Litter

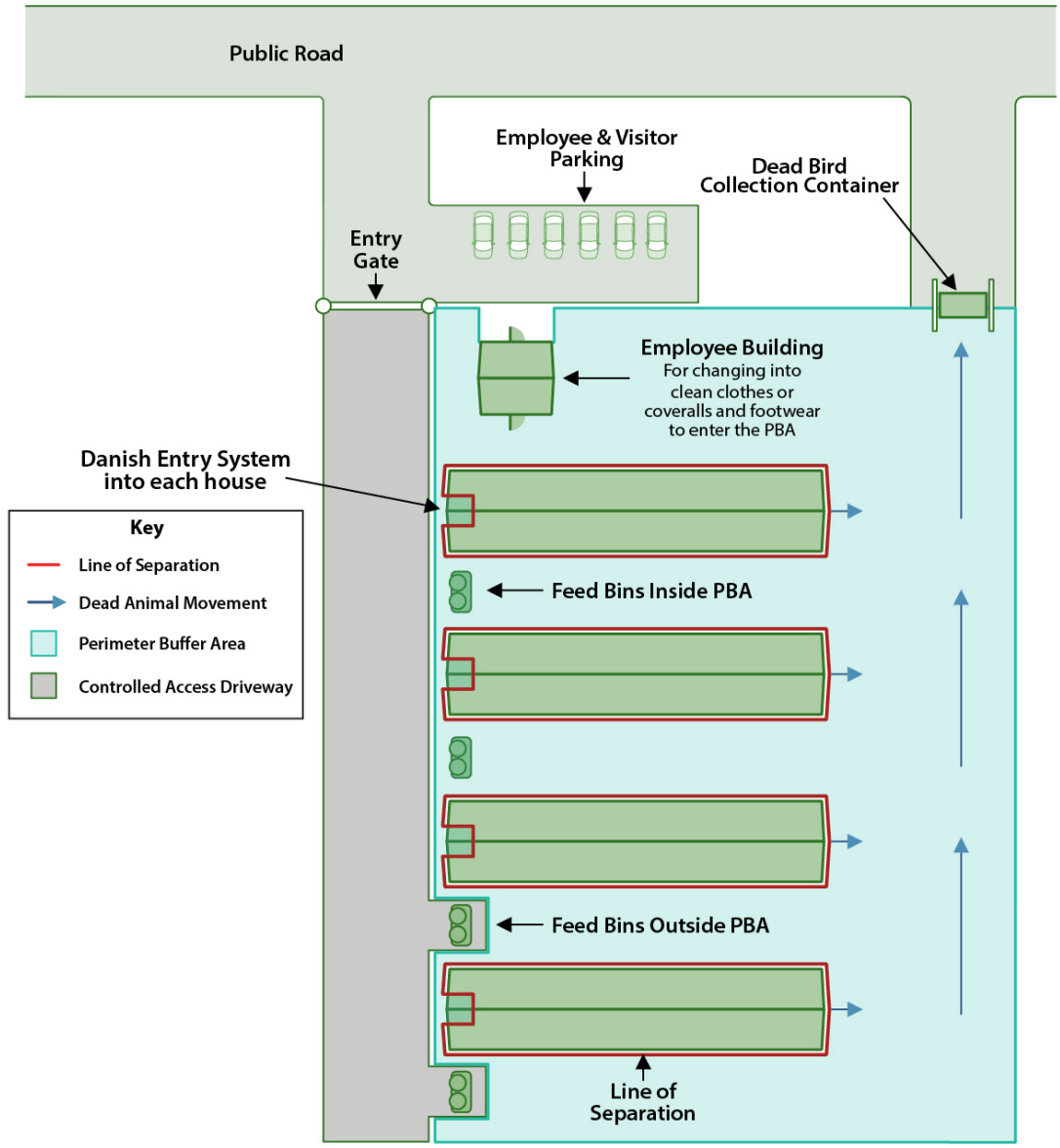
> There is no evidence that contaminated feed or litter contribute to HPAI virus introduction in the recent outbreak. However, feed, feed ingredients and fresh litter can be contaminated if they have been exposed to wild waterfowl or other birds or if they contain insects or rodents that might be carrying the virus. Grain, feed, and fresh litter should be stored and handled so that it cannot be contaminated with AI virus.

Feed, feed ingredients, and replacement litter can be contaminated if they have been exposed to wild waterfowl or other birds or if it contains insects or rodents that might be carrying the virus. There is no evidence that contaminated feed or litter contributed to HPAI virus introduction in the 2015 or other recent outbreaks; however, the following precautions should be taken:

- Grain, feed, and fresh litter should be stored and handled so that it cannot be contaminated or treated to eliminate contamination.
- Grain, finished feed and litter delivery trailers should be covered so that the contents cannot be contaminated during transport.
- Finished feed, feed ingredients, and fresh litter should be stored in closed bins or buildings which exclude the potential for contamination with HPAI virus.
- Finished feed and litter should be transported from storage into poultry houses in a manner that prevents it from being contaminated.

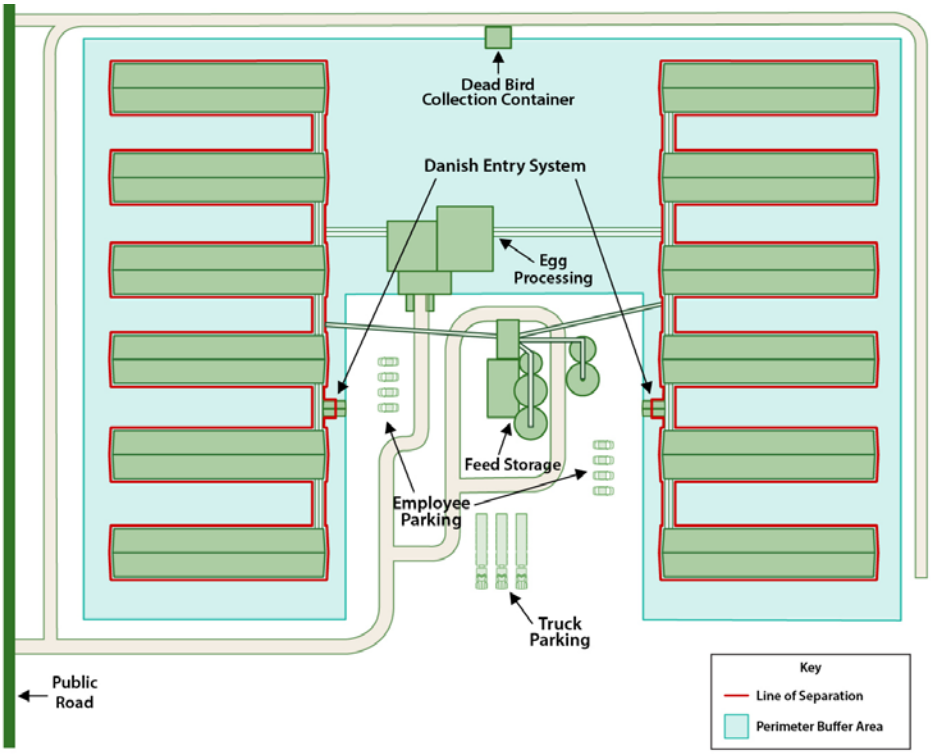
Figures 1 – 3: Examples of Perimeter Buffer Areas and Lines of Separation on Poultry Sites

Figure 1:



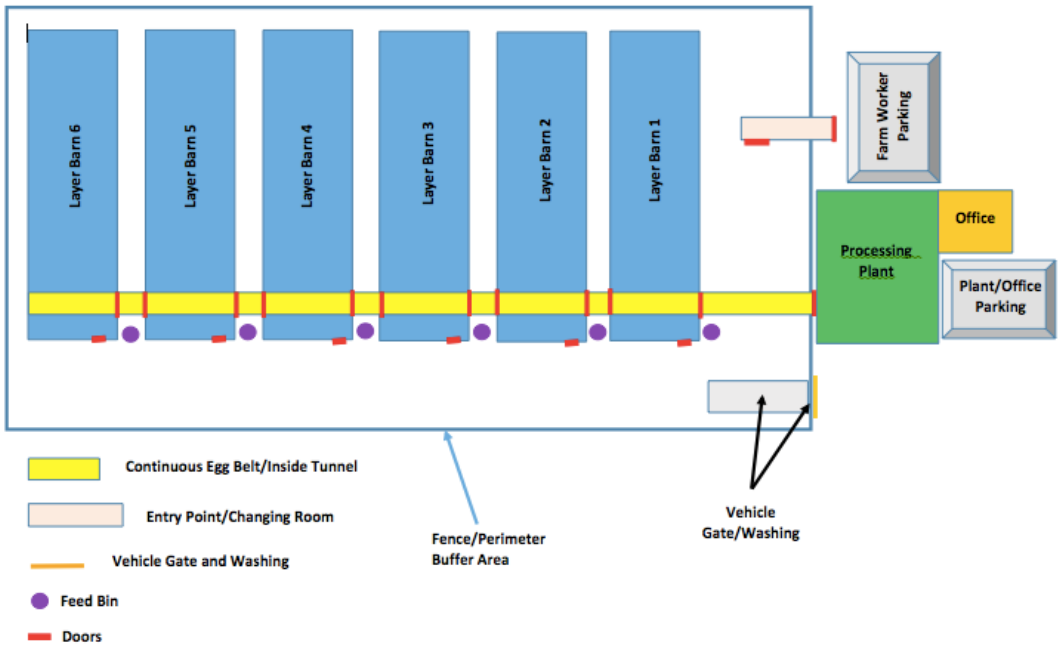
Source: Center for Food Security and Public Health, Iowa State University

Figure 2:



Source: Center for Food Security and Public Health, Iowa State University

Figure 3:

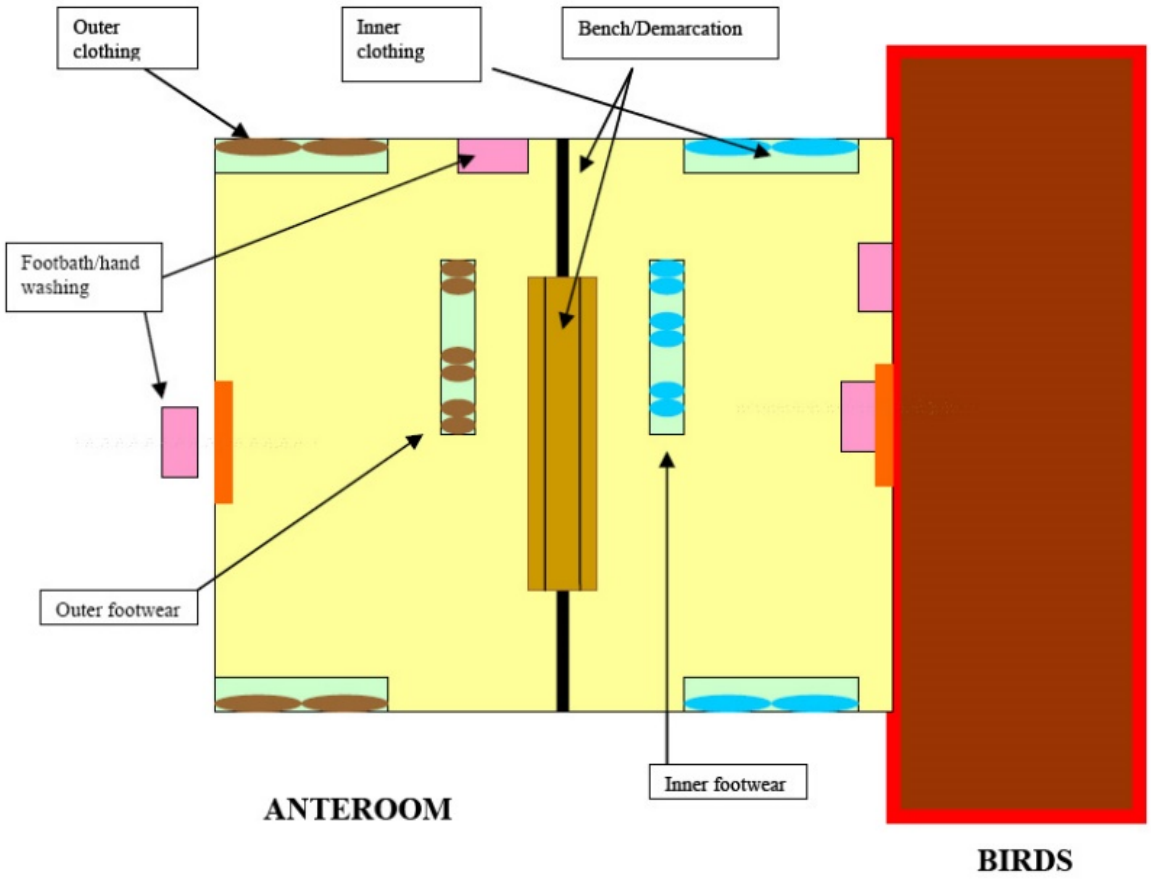


Source: United Egg Producers

Figures 4 – 5: Examples of the Danish Entry System

There are other configurations that will also work. The main objective is for personnel to leave boots and outer clothing in the entry, to wash or sanitize hands, then to put on barn specific boots and outer clothing after crossing the LOS.

Figure 4:



Source: [*http://www.inspection.gc.ca/animals/terrestrial-animals/biosecurity/standards-and-principles/general-producer-guide/eng/1398640321596/1398640379048?chap=9*](http://www.inspection.gc.ca/animals/terrestrial-animals/biosecurity/standards-and-principles/general-producer-guide/eng/1398640321596/1398640379048?chap=9)

Figure 5:

Source: Ontario Pork Industry Council, Danish Entry Examples, 2013

Appendix A: Heat Inactivation Studies for Avian Influenza

HPAI viruses can be inactivated by heat and drying. Several research studies have evaluated the effect of heat on the avian influenza virus. Results reported from these studies are listed below in increasing temperature order. These results are under laboratory conditions; results under field conditions may vary, as does the effect on various influenza strains. Yellow rows indicate temperature and time combinations at which the specific virus was not inactivated. When using heat to inactivate HPAI in buildings or on equipment, it is important to allow time for the heat to penetrate all areas of the building or equipment. Caution should be used when using higher heat temperatures. Equipment damage or degradation (e.g., lubricants, hydraulic fluids, oil) can occur. Extreme hot and cold temperatures can also crack or damage electronic components.

Virus	Temp ºC	Temp ºF	Time	Inactivation	Author/Citation
H5N1	4	39.2	100 days	not inactivated	Shahid, 2009
H5N1	4	39.2	8 weeks	inactivated	Kurmi, 2013
H5N1	15	59	23 days	inactivated	Lu, 2003
H5N1	20	68	23 days	inactivated	Lu, 2003
H5N1	24	75.2	5 days	inactivated	Kurmi, 2013
H5N1	25	77	24 hours	inactivated	Ahmed, 2012
H5N1	25	77	24 hours	inactivated	Chumpolbanchorn, 2006
H5N1	28	82.4	24 hours	loses infectivity	Shahid, 2009
H5N1	37	98.6	24 hours	inactivated	Kurmi, 2013
H5N1	40	104	15 min	inactivated	Chumpolbanchorn, 2006
H5N1	42	107.6	18 hours	inactivated	Kurmi, 2013
H7N9	56	132.8	15 min	not inactivated	Zou, 2013; Shahid, 2009
H5N1	56	132.8	15 min	inactivated	Lu, 2003
H7N9	56	132.8	30 min	loses infectivity	Zou, 2013
H5N1	56	132.8	30 min	loses infectivity	Shahid, 2009
H5N1	57	134.6	10 min	inactivated	Wanaratana, 2010
H7N9	60	140	5 min	not inactivated	Zou, 2013
H7N9	65	149	10 min	loses infectivity	Zou, 2013
H7N9	70	158	1 min	loses infectivity	Zou, 2013
H5N1	70	158	5 min	inactivated	Jeong, 2010
H5N1	70	158	60 min	inactivated	Wanaratana, 2010
H7N9	75	167	1 min	loses infectivity	Zou, 2013
H5N1	75	167	45 min	inactivated	Wanaratana, 2010
H5N1	80	176	2.5 min	inactivated	Jeong, 2010
H5N1	90	194	1 min	inactivated	Jeong, 2010
H7N9	100	212	1 min	loses infectivity	Zou, 2013

References:

- Ahmed ZAM, Hussin HA, Rohaim MA, Nasr SAES. Efficacy of composting dead poultry and farms wastes infected with avian influenza virus H5N1. Am-Euras J Agric & Environ Sci. 2012;12(5):588–596
- Chumpolbanchorn K, Suemanotham N, et al. The effect of temperature and UV light on infectivity of avian influenza virus (H5N1, Thai field strain) in chicken fecal manure. SE Asian J Trop Med Pub Health. 2006;37:102–105.
- Jeong EK, Bae JE, Kim IS. Inactivation of influenza A virus H1N1 by disinfection process. Am J Infect Control. 2010;38(5):354–60.
- Kurmi B, Murugkar HV, et al. Survivability of highly pathogenic avian influenza H5N1 virus in poultry faeces at different temperatures. Indian J Virol. 2013;24(2):272–277.
- Lu H, Castro AE, et al. Survival of avian influenza virus H7N2 in SPF chickens and their environments. Avian Dis. 2003;47(3Suppl):1015–21
- McDevitt J, Rudnick S, First M, Spengler J. Role of absolute humidity in the inactivation of influenza viruses on stainless steel surfaces at elevated temperatures. Appl Environ Microbiol. 2010;76(12):3943–7.
- Paek MR, Lee YJ, Yoon H, et al. Survival rate of H5N1 highly pathogenic avian influenza viruses at different temperatures. Poult Sci. 2010:89:1647–1650.
- Shahid, et al. Avian influenza virus (H5N1) effects of physico-chemical factors on its survival. Virol J. 2009; 6:38.
- Wanaratana S, Tantilertcharoen R, Sasipreeyajan J, Pakpinyo S. The inactivation of avian influenza virus subtype H5N1 isolated from chickens in Thailand by chemical and physical treatments. Vet Microbiol. 2010;140(1–2):43–8.
- Zou S, et al. Inactivation of novel avian influenza A virus under physical conditions or chemical agents treatment. Virol J. 2013:10:289.

Appendix B: Additional Information on Cleaning and Decontamination

Cleaning and decontamination can involve the use of physical (e.g., heat) or chemical (e.g., disinfectant) processes. These processes vary in their level of destruction of infectious agents. Influenza virus is sensitive to a wide range of disinfectants and can also be inactivated by heat and drying; however, organic material must be removed before disinfection can be effective and the disinfectant must completely penetrate any porous material present or it will not reach the pathogens that may be hidden there. A number of chemical disinfectants have been approved for use against avian influenza. Only EPA-registered or approved products should be used. EPA disinfectant products registered and labeled with a claim to inactivate **avian influenza A** viruses on hard, non-porous surfaces can be found at http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm.

Disinfectants can be used or applied in a variety of ways (e.g., spraying, foaming, misting, wiping, submersion). The preparation and application of disinfectant solutions must be in accordance with product label directions. Generally it is best to have clean surfaces dry before disinfectant application. The label also specifies the sites (e.g., poultry houses and farm premises) for application of the product. Fumigation may be used in some situations for items that cannot get wet (e.g., electronics).

Contact time is essential! Microorganisms are inactivated or killed by disinfection products gradually, not instantaneously. Allowing adequate contact time will increase the efficacy of any disinfectant. Contact times may vary depending on the product or method used and the ambient temperature and should be specified on the label of the product selected. Areas being disinfected should remain wet with the disinfectant during the necessary contact time. Reapplication of the disinfectant solution may be necessary to achieve the indicated contact time found on the product label. Some disinfectants may evaporate quickly (i.e., alcohols), while others may have residual activity (i.e., phenols).

Debris and organic material can also inactivate many disinfectants (especially chlorine and iodine containing compounds). Removal of all organic material prior to application of a disinfectant is essential. In some cases of lightly soiled equipment, dry cleaning with compressed air or blowers may be preferable.Some disinfectants may have some efficacy or residual activity in the presence of small amounts of organic material (i.e., phenols) and should be considered in circumstances where complete removal of organic debris is difficult but the phenols still must penetrate any organic material present. However, application of these products to a heavy organic load (e.g., non-cleaned surfaces) will not likely be effective.

Additional Factors Affecting Cleaning and Disinfection Efficacy Should be Considered:

Surface type: Porous, uneven, cracked, or pitted surfaces, especially wooden surfaces and earthen floors, can hide microorganisms; these surfaces are difficult to disinfect. Some chemical disinfectants may also be incompatible with or corrosive to certain materials or surface types (e.g., metal, rubber, plastic). Due to the construction and presence of uneven surfaces on equipment, equipment cleaning and disinfection procedures can be difficult. Heat may be a more effective method for inactivating the virus on these surfaces.

pH: The activity of some disinfectants is also affected by pH because it changes the degree of ionization of a chemical disinfectant, thereby impacting efficacy. For example, the efficacy of phenols, acids, and hypochlorites are decreased as pH increases; in contrast, quaternary ammonium compounds have greatest efficacy at as pH increases.

Water source: The water source used when diluting and applying detergents and disinfectants is important. Water hardness can inactivate or reduce the effectiveness of certain disinfectants (i.e., quaternary ammonium compounds). Be sure to consider any standing water or other water sources (e.g., rainfall) present that may immediately dilute the disinfectant during application

Temperature: Some disinfectants are less effective or ineffective at low temperatures (e.g., cold weather conditions). Additionally, disinfectant solutions may freeze outdoors under low temperature conditions. When possible, buildings and equipment should be heated to approximately 68^{o}F (20^{o}C) when applying disinfectants. Elevated temperatures can aid in microorganism destruction; however, higher temperatures can also accelerate decomposition or evaporation of a disinfectant, thereby reducing the necessary contact time and efficacy. Excessive heat may also damage items being disinfected.

Weather: Inclement weather conditions (e.g., cold, rain, wind) may also make these procedures difficult.

Organic matter (i.e., soil, bedding, litter, feed, manure) provides a physical barrier that protects microorganisms from contact with the disinfectant. Cleaning and disinfection procedures should be carried out in a systematic manner to ensure effective reduction, removal, inactivation and destruction of the virus.

The basic C&D protocol, regardless of item involved, is as follows:

Dry clean: Remove any gross contamination and organic material.

Wash and rinse: Wash item with a detergent solution to further remove organic debris. Inspect for cleanliness and repeat wash procedure if not clean.

Dry: When possible complete drying of the items should occur before disinfectant application

Disinfection application: Apply an EPA-registered disinfectant. Follow the manufacturer directions for concentration and contact time of disinfectants. Ensure all areas are covered thoroughly with the solution and remain “wet” with the solution for the necessary contact time. Apply disinfectant a second time if necessary.

Rinse and dry: Rinse equipment thoroughly with clean, warm water. Thorough rinsing can be very important as some disinfectant solutions may cause damage to surfaces (e.g., deterioration of rubber or corrosion of metal parts), if not completely rinsed away. Allow items(s) to air-dry.

For all of the procedures above, ensure that run-off water is captured or denatured to prevent virus or chemical contamination of the environment.

Fresh solutions should be prepared prior to use; some disinfectant solutions may only be active for the same day of preparation. Failure to make fresh solutions may result in using a product that has reduced efficacy. The use of test kits can help to determine whether any chemical degradation of the disinfectant's active ingredients has occurred and that diluted solutions contain the necessary amount of active ingredient. Maintain an operating log, noting the temperature of wash and rinse waters, and detergent and sanitizer concentrations.

Metal surfaces (e.g., stainless steel, aluminum) are generally easier to disinfect than other materials, especially when the surfaces are smooth. However, some chemical disinfectants are incompatible or corrosive with metal surfaces (see table below). Flame guns or other thermal methods may be a useful alternative for some metal surfaces.

Chemical Disinfectant	Effect on metal surfaces
Sodium hydroxide	Corrosive to aluminum and derived alloys, and galvanized metal
Sodium carbonate	Corrosive to aluminum and derived alloys
Acids	Highly corrosive to metals
Glutaraldehyde, Virkon® S	Mildly corrosive to metals
Iodophors, hypochlorites, formaldehyde	Corrosive to some metals
Phenolics	Relatively non-corrosive

Rubber and plastics should be treated as hard, nonporous surfaces, however they may have interactions with some chemical disinfectant products (e.g., phenols, sodium hydroxide). Iodophors may cause staining of these materials and can be corrosive to some plastics or rubber. Alcohols can swell or harden rubber or certain plastic tubing after prolonged and repeated use. Excessive heating can melt most plastics.

Wood is extremely porous and therefore difficult to disinfect. Any decaying wood surface that cannot be disinfected should be removed, and disposed of appropriately (e.g., burn or burial). Wood surfaces should not be rinsed, soaked, or sprayed with plain water prior to washing or disinfectant application as this can cause unintended dilution; dry cleaning may be adequate and preferable. A disinfectant solution of a product registered for wood surfaces should be applied once gross organic debris has been removed.

Footwear disinfection procedures should follow basic C&D protocol when entering and exiting facilities. Remove organic matter (scrub brush); wash and rinse. Contact time with disinfectant solution is essential. Footwear disinfection stations should be set up at entry sites. Everyone is required to clean and disinfect their footwear or wear site-provided footwear or new footwear covers prior to entering production facilities, or processing areas. Wet footbaths must be changed at least daily or more often if the footbath collects dirt or manure and protected from the elements, freezing and dilution.

Most disinfectants can cause irritation to eyes, skin, and/or the respiratory tract; some may cause burns or other injury. The safety of all personnel must be paramount when handling, mixing, and applying chemical disinfectants. Appropriate PPE (e.g., gloves, goggles, masks) should be worn. It is essential that C&D personnel are trained on the proper mixing and application procedures as well as the hazards of the products they will be using. Always read the label for any safety concerns to people, animals, or the environment.

References:

- USDA APHIS. Foreign Animal Disease Preparedness and Response Plan Guidelines: Cleaning and Disinfection. 2014 Jul. Available at: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/nahems_guidelines/cleaning_disfection.pdf
- Secure Egg Supply (SES) Plan. Supplement 2: Cleaning and Disinfection Guidelines. 2013 Aug. Available at: http://secureeggsupply.com/wp-content/uploads/SES_Plan_Suppl2_CD_Guidelines2.pdf
- Maillard JY. Factors affecting the activities of microbicides. In: Fraise AP, Maillard JY, Sattar SA, eds. Russell, Hugo & Ayliffe's Principles and Pratice of Disinfection, Preservation and Sterlization, 5th edition. West Sussex, Wiley-Blackwell. p. 71–86.
- Amass SF, Ragland D, Spicer P. Evaluation of the efficacy of a peroxygen compound, Virkon® S, as a boot bath disinfectant. J Swine Health Prod. 2001;9(3):121–123.
- Amass SF, Vyerberg BD, Ragland D, et al. Evaluating the efficacy of boot baths in biosecurity protocols. J Swine Health Prod. 2000;8(4):169–173.