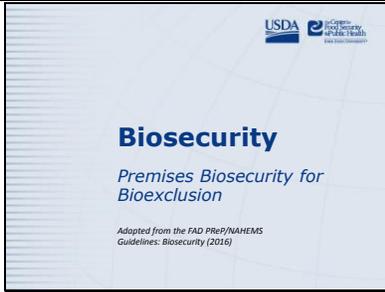
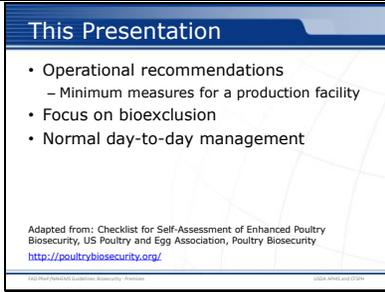


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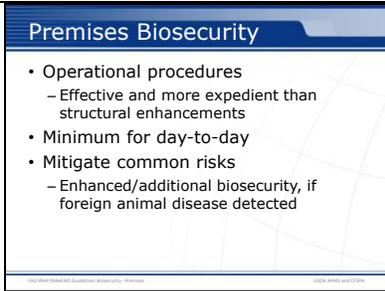
Biosecurity is a cornerstone of livestock production systems (including poultry production) to maintain food safety and security, protect the environment, and facilitate continuity of business by protecting animals and animal products. In addition to the daily protocols to protect the health of livestock populations, biosecurity is crucial in containing disease in a foreign animal disease (FAD) outbreak. Should the FAD also be zoonotic, biosecurity is necessary to protect public health. Understanding the risks of disease transmission and the necessary preventive procedures will be essential during the response. [This information was derived from the *Foreign Animal Disease Preparedness and Response (FAD PReP)/National Animal Health Emergency Management System (NAHEMS) Guidelines: Biosecurity* (2016)].

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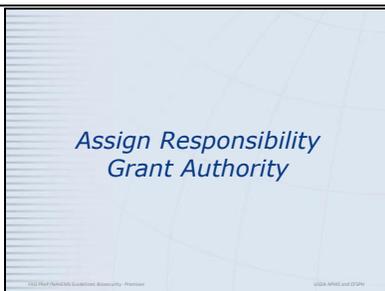
This presentation focuses on recommended operational biosecurity concepts and measures that can be implemented to protect the health of livestock from disease introduction and exposure. The concepts presented focus on bioexclusion to protect a healthy herd/flock; however, many can also be applied to the containment of disease. The recommendations for premises biosecurity in this presentation may be considered the minimum for a production facility, to be incorporated into day-to-day management practices. They are based on recommendations adapted from the *Checklist for Self-Assessment of Enhanced Poultry Biosecurity*, accessible on the US Poultry and Egg Association, Poultry Biosecurity website at: <http://poultrybiosecurity.org/>. Additional PowerPoint presentations discussing these and other biosecurity topics are also available in this series.

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The scope and spread of recent livestock disease outbreaks in the United States has demonstrated that routine biosecurity practices for some livestock premises may have been inadequate to prevent the introduction of disease. Quickly implementing major enhancements to structural biosecurity in existing facilities may not be possible. The recommendations in this presentation emphasize the elements for improving biosecurity that are believed to be the most effective and that can be implemented in a timely manner. These recommendations are intended as minimum operational biosecurity measures for day-to-day management. They address mitigation of some common risks, which can be implemented in a variety of livestock production facilities. However, producers need to consider enhancing both structural and operational biosecurity to reduce their overall vulnerability to disease. If an FAD is detected in the United States, or in the region, additional biosecurity procedures may be necessary.

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Each production site (or integrated system) should have an individual assigned to designing and developing a site-specific biosecurity plan and implementing effective biosecurity procedures. This same individual is granted the authority to implement the plan, monitor and enforce compliance, and make modifications when necessary. The title of this individual may vary; the titles of Biosecurity Officer and/or Biosecurity Manager have been suggested.

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**Biosecurity Officer/Manager**

- Assigned individual, title may vary
- Develop site-specific biosecurity plan
- Implement effective procedures
- Institutionalize the plan
  - Clearly written
  - Trains all personnel with appropriate materials
- Address changing needs
- Monitor compliance by everyone

A Biosecurity Officer or Biosecurity Manager (the title may vary) assigned to this task most likely is associated with the facility and may need to consult with a veterinarian to develop the most effective plan. The biosecurity plan should be institutionalized as clearly written procedures. Details may be articulated in standard operating procedures documents. This Biosecurity Officer/Manager is responsible for implementing the plan, and training all personnel who enter the premises with the use of appropriate training materials. This individual adapts the plan to changing needs, and continuously monitors the procedures for compliance with the plan. Everyone, emphasize everyone, needs to comply.

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**Biosecurity Officer/Manager cont'd**

- Authority to:
  - Stop violations
  - Take corrective actions
  - Certify the biosecurity plan has consistently been followed by all

The Biosecurity Officer/Manager should have the authority to stop violations, take corrective actions as needed, and have the authority to certify that the biosecurity plan has consistently been followed by all.

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**Training of Personnel**

- Ensure compliance
- Biosecurity plan communicated and distributed
  - To everyone who accesses the facility
- Training on site-specific biosecurity procedures
- Training materials
- Documented, with ongoing audits and refreshers

To ensure compliance, the Biosecurity Officer/Manager is responsible for training. The site-specific biosecurity plan should be communicated and distributed to everyone who accesses the facility. In the case of normal operations, farm employees, contract crews, truck drivers, service personnel, and all visitors are trained on site-specific biosecurity procedures. Training materials should be provided in languages understood by those being trained. The training should be reviewed and documented. Everyone needs to understand the concepts and procedures that apply to their area of responsibility and understand the importance of all the steps. Audits and periodic refresher training should be ongoing.

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*Separation of Clean and Dirty*

A major concept in biosecurity is the separation of clean and dirty areas. For clarification, “clean” refers to non-infected, protected areas and areas where healthy animals are located. “Dirty” refers to areas or things that may be contaminated and a potential source of infection. This separation protects healthy animals from sources of infection and contains a disease in an outbreak. All biosecurity measures are intended to prevent the movement of pathogens from the dirty to the clean side that may expose susceptible animal populations.

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**Line of Separation**

- Line or barrier
  - Imagined (i.e., painted line on the ground)
  - Physical obstruction
- Separating clean from dirty
  - Clean = non-infected
  - Dirty = potential source of infection
- Clean/Dirty Line, C&D Line
- Site-specific
  - Farm level, barn level, or between

An essential component of biosecurity is the line or barrier—imagined or physical—separating clean (non-infected) from dirty (potential sources of infection). This barrier may be termed the Line of Separation, or the Clean/Dirty Line, and may serve as a Cleaning and Disinfection Line (C&D Line). In some cases, the Line will be a barrier/physical obstruction, such as a bench to cross, that separates areas. This barrier or Line of Separation will be site-specific, and may be implemented at the farm level (e.g., the circumference of the farm), or at the barn level (e.g., the walls of each individual housing unit); some plans may establish this Line somewhere in between.

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**Line of Separation cont'd**

- Biosecurity plan addresses
  - How Line is defined and defended
  - For each type of movement across
- Point of crossing
  - Critical control point to stop transfer of disease
- Limited access across Line



The biosecurity plan must address how this Line will be defined and defended for each type of movement that needs to cross this Line from the dirty to the clean side. A location where movement crosses this Line becomes a critical control point to stop the transfer of disease. The plan will identify essential versus nonessential movements across this Line, and define the biosecure procedures to enable essential movement across this Line, avoiding the transfer of disease agents. Biosecurity protocols for people crossing the Line will be different than those for vehicles crossing the Line. For biosecurity purposes, limiting the number of controlled access points across this Line will simplify mitigation. Ideally, limiting access to only one location will greatly enhance compliance of strategic actions implemented there.

*[This photo, taken in an entry to an animal building, shows a highly visible, painted Line of Separation, and street shoes which have been left on the dirty side. Photo source: Pam Zaabel, Iowa State University]*

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**Perimeter Buffer Area**

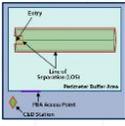
- Incorporated into plans for animals raised indoors
- Sanitation standard reduces pathogen load in the environment
- Additional separation between contaminated and non-contaminated
- Further protects susceptible animals
- Clearly delineated

Biosecurity plans, particularly plans for livestock raised indoors, may incorporate a Perimeter Buffer Area as a transition area. Imposing a certain sanitation standard on everything entering the Perimeter Buffer Area reduces environmental contamination and pathogen load. This peripheral buffer needs to be well defined and marked, since it serves to place additional separation between the contaminated and non-contaminated space, and further protect the susceptible animals.

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**Perimeter Buffer Area**

- No visible contamination
- Keep premises traffic patterns within it
- Account for traffic patterns, topography, weather, and pathogen
- Reentry through a controlled access point – C&D



In this example, the (green) building is an illustration of a barn for animals raised indoors. The producer has designated the walls of the building to serve as the Line of Separation (red) isolating the animals from contamination. Immediately outside the building, the producer has designated a Perimeter Buffer Area as a transitional area to reduce environmental contamination. Sanitation efforts include preventing visible contamination from entering the Perimeter Buffer Area and keeping premises traffic patterns within it. When determining the Perimeter Buffer Area for each facility, account for traffic patterns on the premises, the topography around the animal housing, weather extremes, and what is known about the pathogen and its infectivity. If personnel need to leave the Perimeter Buffer Area, they reenter through a controlled access point, following appropriate biosecurity measures. An operational C&D Station is recommended to remove visible contamination from vehicles, equipment, and items needing to enter this area. To repeat, the Perimeter Buffer Area should be clearly delineated and located so that personnel comply with biosecurity procedures related to that area. *[This is an example of implementation of a Perimeter Buffer Area and a Line of Separation protecting animals in one housing unit. Illustration by: Sydney Heppner, Iowa State University]*

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**Biosecurity Protocols**

The following slides address some recommendations to mitigate common risks. Operational protocols and procedures to lessen the risks associated with the movement of personnel, vectors, equipment, vehicles, carcasses, manure/litter, bedding, and animals themselves are discussed. Recommendations on avoiding the introduction of pathogens in the water supply is also covered.

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**Personnel**

- Personnel and clothing/footwear
- Site-specific procedures
- Actions required before arrival
- Actions at critical control points
  - Limits/controls access of pathogen to "clean" area via personnel
- Shower/don clean outerwear
- Mandatory to cross Line of Separation and/or enter Perimeter Buffer Area

Personnel and their clothing/footwear may become contaminated by disease agents through direct and/or indirect exposure when they are off-site. Site-specific biosecurity procedures are intended to minimize the risk of transferring disease across the critical control points. Showering and changing into clean clothes immediately prior to arriving at the premises, or upon arrival, will greatly reduce the risk of disease introduction. Many facilities are shower-in/shower-out, and maintain the facility-specific outwear on-site, including boots, that personnel and visitors don when crossing the Line of Separation. The same concept applies to anyone who enters the clean area, such as the Perimeter Buffer Area or crosses the Line of Separation. It is mandatory that all personnel comply with the level of biosecurity implemented at that site.

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**Danish Entry System**

- An example of Line of Separation

The diagram illustrates a Danish Entry System. It shows a 'Clean' area on the left and a 'Dirty' area on the right, separated by a central 'Line of Separation' (a brown bench). Personnel enter from the 'Clean' side, cross the bench, and enter the 'ANIMALS' area. The diagram also shows 'Clean' and 'Dirty' clothing and equipment areas, and a 'Line of Separation' between the 'ANTEROOM' and the 'ANIMALS' area.

This illustration shows an example of a Danish Entry System, utilizing a bench dividing the anteroom and providing a visual and physical Line of Separation between clean and dirty areas. With this type of anteroom, personnel who are potentially contaminated enter the room from the left and are prompted to perform the appropriate biosecurity protocols prior to crossing the Line of Separation (centered brown bench) to enter the animal building on the right. The same protocols are followed in reverse as personnel leave the animal housing on the right, crossing back across the Line of Separation to leave. (More examples of operational biosecurity are discussed in the "Operational Biosecurity Measures" PowerPoint presentations as part of this series.)

[This example of a Danish Entry System is adapted from <http://www.inspection.gc.ca/animals/terrestrial-animals/biosecurity/standards-and-principles/general-producer-guide/eng/1398640321596/1398640379048?chap=9>. Illustration by Sydney Heppner, Iowa State University]

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**Vectors – Pets, Wildlife, and Insects**

- Prevent transfer of disease by vectors (biological and mechanical)
- Address the exclusion or elimination of vectors
- Avoid environmental contamination
- Prevent the movement of contaminated material
- Mitigate situations and habitat that attract wildlife and scavengers

Control measures should be implemented to prevent the transfer of disease by wildlife (i.e., wild birds, rodents), feral animals, and insects. Some of these living organisms can act as biological vectors. Pets residing on production facilities, as well as wildlife, can contribute to disease risk as mechanical vectors. Control measures should address the exclusion or elimination of these vectors. Measures also include avoiding environmental contamination through wildlife feces or infectious secretions, and preventing the movement of contaminated material. Protocols should mitigate situations and habitat that are attractive to wildlife and scavengers, such as spilled feed, disposal areas, or wildlife nesting areas.

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**Equipment**

- Clean and sanitize before crossing the Line of Separation
- Have sufficient equipment available
- Avoid sharing

Biosecurity measures should diminish the opportunity for equipment to serve as fomites. Equipment should be effectively cleaned and sanitized before crossing the Line of Separation. Disease agents are easily transferred by the sharing of equipment by different animal populations. An important biosecurity measure is to have, provide, and use sufficient equipment to avoid sharing.

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**Vehicles**

- Exclude (unnecessary) vehicles from crossing the Line of Separation
- Thorough cleaning and disinfection prior to crossing
- Attention to wheels, wheel wells, and animal cargo areas
- Limit pathways of internal vehicles



Vehicles are a source of contamination with pathogens from other farms or from other animals. If at all possible through structural measures or operational processes, exclude vehicles such as feed deliveries, milk haulers, load-out carriers, and employee and visitor cars from crossing the Line of Separation. Vehicles crossing into the protected area of the premises should be thoroughly cleaned and disinfected. Particular attention needs to be paid to wheels and wheel wells. Frequently clean and disinfect those vehicles utilized internally to service the facility, and keep their pathways limited to within the Perimeter Buffer Area. Thoroughly clean and disinfect the cargo area of animal transport vehicles between loads.

*[This photo shows the cleaning and disinfecting of a vehicle paying particular attention to the wheels and wheel wells. Photo source: Danelle Bickett-Weddle, Iowa State University]*

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**Carcass/Manure Disposal**

- Protect susceptible animals from exposure
- Avoid cross-contamination of pathways
- Keep disposal service vehicles outside the Line of Separation
- Prevent attracting wild animals or scavengers

Disposal procedures should be designed and implemented to prevent exposure of susceptible animals to disease. Carcasses, manure, and spent litter may be a biosecurity risk, and should be disposed of in a manner that prevents cross-contamination of other production pathways and traffic patterns. Avoid animal areas in the removal process as much as possible. Avoid cross-contamination by separating the disposal pathway from the feed distribution pathway. Service vehicles for disposal pickup have likely visited other facilities and may have been contaminated off-site. Design processes that keep service vehicles outside the Line of Separation, and outside the Perimeter Buffer Area, if possible. In addition, the storage and disposal process should also prevent the attraction of wild animals or scavengers.

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**Animals**

- Closed herd or additions with documented health status
- Isolate new animals for 30 days
- All-in/all-out management
- Housing cleaned between groups
- Animals transported in cleaned and disinfected vehicles

Prevent disease introduction through animal management and replacement decisions. Additions to the herd/flock may be made from offspring born and raised on the operation, which is described as a closed herd. Replacement livestock/poultry from outside the operation, including semen and embryos, should come from herds/flocks with documented biosecurity practices and a history of freedom from infection, preferably based on diagnostic testing. New additions should be isolated/quarantined for as long as 30 days before being allowed to co-mingle with the existing population. Ideally animals should be managed as all-in/all-out, meaning groups of the same age stay together from the time of arrival, through growth, until they leave for processing. Between one group leaving and the arrival of the next group, the housing is cleaned, disinfected, and left empty for a period of downtime to minimize carry over of pathogens from one group to the next. Transport animals in vehicles cleaned and disinfected (exterior and cargo areas) to minimize the risk of disease transmission from previously transported loads.

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**Feed, Bedding/Litter, Water Supply**

- Can be contaminated if exposed to pathogens
- Store and handle properly
- Immediately clean grain spills
- Deliveries at remote locations
- Use water from deep wells or treated sources

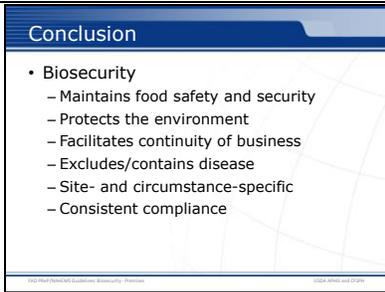
Feed, feed ingredients, bedding/litter, and water can be contaminated if they have been exposed to a disease pathogen through vectors or containers acting as fomites. Grain, feed, and fresh bedding/litter should be stored and handled so that it cannot be contaminated, such as in closed containers. Clean any grain spills immediately so as not to attract scavengers. Accept outside deliveries at a location remote from animal areas, and shuttle products by on-site equipment to internal locations. Water should come from deep wells or sources that have been treated to eliminate any potential contamination with live pathogens.

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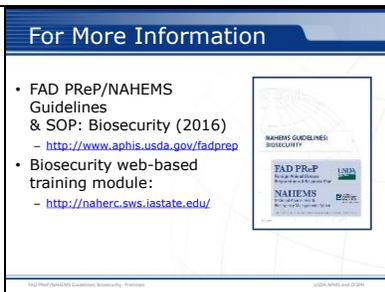
Premises biosecurity is an important component of the continuity of business plans, also known as the Secure Food Supply Plans. The goal of the Secure Food Supply Plans is to provide guidelines for producers, transporters, and processors to minimize disease spread during an FMD outbreak while ensuring a continuous, safe, and wholesome supply of animals and animal products for consumers. Biosecurity standards are described in, and are specific to, each plan. Some standards are still in development. Web links to the Secure Food Supply Plans for Eggs, Broilers, Turkeys (these three being integrated in the one Secure Poultry Supply Plan), Milk, and Pork are found in the *FAD PRoP/NAHEMS Guidelines: Biosecurity and Continuity of Business* documents. In addition, the Secure Beef Supply Plan is in development.

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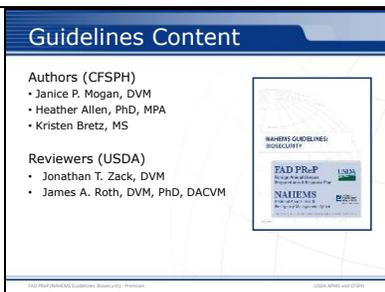
In conclusion, biosecurity helps to maintain food safety and security, protect the environment, and facilitate continuity of business by protecting animals and animal products. The importance cannot be over-emphasized in daily protocols intended to exclude disease, as well as in plans to contain disease. Plans and protocols are developed based on the assessment and evaluation of each individual site, and circumstances. Established biosecurity measures are effective only when they are consistently followed by everyone

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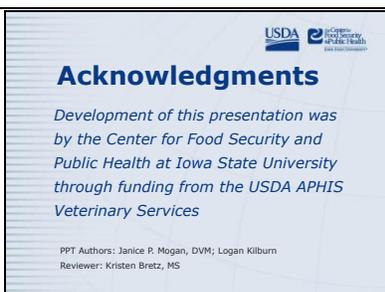
More details can be obtained from the sources listed on the slide, available on the USDA website (<http://www.aphis.usda.gov/fadprep>) and the National Animal Health Emergency Response Corps (NAHERC) Training Site (<http://naherc.sws.iastate.edu/>).

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The print version of the Guidelines document is an excellent source for more detailed information. This slide acknowledges the authors and reviewers of the Guidelines document. It can be accessed at <http://www.aphis.usda.gov/fadprep>.

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Information provided in this presentation was developed by the Center for Food Security and Public Health at Iowa State University College of Veterinary Medicine, through funding from the US Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services.