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Biosecurity – Keeping Diseases from Being Transported onto the Farm

Drs. Lisa Tokach and Megan Potter
PorkBridge
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Abilene Animal Hospital, P.A.
785-263-2301
www.aahpa.com

What is biosecurity?

bi-o-se-cur-i-ty
bīōsiˈkyo͝oritē/, noun
noun: biosecurity; noun: bio-security
procedures intended to protect humans or animals against disease or harmful biological agents.

What is farm biosecurity?

• Farm biosecurity is a set of measures designed to protect a property from the entry and spread of pests and diseases. Farm biosecurity is your responsibility, and that of every person visiting or working on your property.

Why should I care?

• If a new pest or disease becomes established on your farm, it will affect your business:
  – reduced productivity or loss of markets
  – increased costs (for monitoring, production practices, and labor)
  – early detection and immediate reporting of an exotic pest or disease increases the chance of effective and efficient eradication (the sooner we know, the sooner we can try to fix it and minimize the damage!).

Why do we need biosecurity?

• Prevention of NEW disease spread
  – PEDv
  – PRRS
  – Mycoplasma
  – SIV
  – Enteric diseases
PEDv: History

- PEDv is caused by an enveloped coronavirus
- Entered the US in April 2013
- PED virus genome identified in the US is closely related to the Asian strains; specifically a strain in China’s Anhui Province
- Later in 2013 a genetic variant to PEDv was identified, differed from ‘classic’ and is PEDCoV
- Now a third coronavirus, delta coronavirus (SDCv), is causing outbreaks in US
- 3 new coronavirus introductions into the US within a year – biosecurity must be improved

PEDv - Transmission

- Fecal oral transmission
- Greatest concentration of virus in baby pig feces due to a high number of permissive intestinal cells (mature enterocytes)
- Very stable in the environment
  - Can survive in manure slurry for at least 28 days at 4 and -20°C (39 and -4°F) and 14 d at 25°C (77°F) (Goyal, 2014)
  - Can survive in fresh feces for at least 7 days at 40, 50 or 60°C (104, 122, or 140°F) (Goyal, 2014)
- Very small amount needed to infect an pig
  - Dilutions up to 10^9 were able to produce clinical signs (Goyal, 2014)
- Contaminated transport and aerosol movement of fecal material can result in transmission
- Survival increases dramatically in cold weather
- Is sensitive to many commonly used disinfectants but NOT Lysol

PEDv: Clinical signs

- All ages of pigs are affected
- After exposure and recovery pigs become temporarily immune
- Death loss of ~100% in nursing pigs until pigs are able to consume milk with protective antibody
- Little death loss in weaned and older pigs but they do show clinical signs and production is lost

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PEDv: Sow farm management

- Whole herd exposure to put all animals on the same immunity development timeline
  - Fecal material with infectious virus can be used – remember fecal oral transmission
- Once entire herd is exposed it is time to start with thorough cleaning and disinfection
- If a chronic, endemic situation arises, protecting the pigs that are <7 days is critical
  - Focused biosecurity for young pigs – limit people traffic in rooms with pigs < 7 days old (clean clothes, equipment, boots, gloves in the room)
  - Do not move pigs after dry
  - Limit handling to necessary treatments only – do not to spread virus from litter to litter
PEDv: Nursery/finisher management

- Nursery and finisher pigs should be able to survive a PEDv infection
  - Enough immature/mature intestinal cells present
- Supportive care with electrolytes and environmental control (warm, dry, draft-free) are necessary
- If isolated infection within a system, limit people traffic from barn to barn – do not move the virus!
- Equipment used in the infected barn should remain there until cleaned and disinfected.

PRRS: History

- PRRS is caused by an enveloped Arterivirus
- First described in the US in 1987
- 2 major strains in the world – US (Type 2) and European (Type 1) but both can be found in the US
- PRRS virus targets pulmonary alveolar macrophages
- Different strains vary in virulence

PRRS: Transmission

- Spread by direct contact with infected secretions or blood
  - Pigs may carry the virus in their tissues for >200 days once infected
  - Viremia persists for several weeks
  - Shedding occurs up to 92 days in secretions including urine, feces, semen, milk, oral and nasal fluids
  - Shedding carrier animals pose a significant risk with this virus
- Aerosol transmission has been shown to occur
- Vertical (dam to piglet) and lateral transmission (pig to pig) must be considered in management strategies

PRRS: Clinical Signs

- PRRS targets and replicates in lymphoid tissues
- Pulmonary alveolar macrophages become a site of infection and replication leading to compromised function and pneumonia
- PRRS causes also cause reproductive signs in sow farms including off-feed events, abortions, and early farrowing
- Pigs may be weak, stillborn, or mummified depending on the stage of gestation when the infection occurred
  - Pigs are affected in-utero due vascular damage to umbilical vessels resulting in a lack of oxygen to the piglet
- Signs in grow-finish include pneumonia with thumping, lethargy, off-feed, increased mortality, and poor performance
- Secondary infections are common with PRRS and exacerbate clinical signs

PRRS: Sow farm management

- Negative sow farm
  - Biosecurity to keep virus out – transport, people, facilities
  - Testing protocols for incoming replacement stock and semen
- Positive sow farm but stable
  - Acclimatize replacement gilts – gilts must become exposed and immune before entering the sow farm
- New PRRS introduction
  - Whole herd exposure to virus to place all animals on the same timeline to immunity
  - Pig flow to “walk” the virus out of the farm – goal is to produce negative pigs
- Vaccines available – issues of cross-protection

PRRS: Nursery/finisher management

- Negative flows
  - Biosecurity to keep the virus out – people, facilities
  - Transport biosecurity around marketing must be a focus
- Positive flows
  - Pig comfort is critical
  - Monitor and treat for secondary bacterial infections
  - Pig flow – all in/all out if possible
  - Vaccines available – issue of cross-protection between strains
Mycoplasma

- Several forms of *Mycoplasma* spp.
  - *Mycoplasma hyopneumoniae* (pneumonia)
  - *Mycoplasma hyosynoviae* (lameness)
  - *Mycoplasma hyorhinis* (lameness)
  - *Mycoplasma suis* (anemia, reproductive effects, poor performance)
- We'll focus on *Mycoplasma hyopneumoniae* (*M. hyo*) as this is a common bacteria to consider when developing a biosecurity plan.

*M. hyo*: Transmission

- Shedding dams (P1 dams or gilt litters primarily) pass the bacteria to their piglets
  - Once sows become infected and immune they are resistant to re-infection and they pass protective antibodies on to their pigs
- Direct contact with respiratory secretions
- Aerosol transmission has been show to occur but a shorter distances than some of the previously discussed pathogens

*M. hyo*: Clinical signs

- Dry, non-productive cough in 3-6 month old pigs
  - stand up, “cough, cough, cough” and then go to the feeder to eat
- Damage to cilia sets up a favorable lung for secondary pathogens
  - Makes PRRS and porcine circovirus type 2 worse
- Increased mortality and reduced ADG

*M. hyo*: Management

- Management
  - Vaccines available which lessen the severity of lung lesions but do not prevent the infection
  - Treat of affected pigs with pneumonia and thumping
- Elimination
  - Allow breeding herd to become infected and cease shedding prior to farrowing
  - Allow herd to new animal introductions
  - Determine timing of natural exposure, add approximately 240 d (shedding period) to obtain the time when gilts should farrow and not shed bacteria to piglets
  - Antibiotics and vaccine may be strategically used with an elimination plan
  - Need to keep majority of pigs *M. hyo* negative in the down stream flow to make elimination worthwhile

Swine Influenza Virus (SIV): History

- SIV caused by type A influenza virus (family Orthomyxoviridae)
  - H1N1, H1N2, H3N2 and now H3N1 detected in US swine herds
    - H1N1 first identified in 1981
    - H1N2 and H3N2 appeared in 1990s
    - H3N1 - rare occurrence but recently detected again
- SIV easily re-assorts and can include genes from human and avian strains
  - People and bird biosecurity is critical to minimize likelihood of genetic shift

SIV: Transmission

- Direct contact with shedding pigs (nasal secretions)
- Aerosol transmission over short distances
- People to pig and pig to pig transmission can occur
SIV: Clinical signs

- SIV has a short incubation period (1-3 days)
  - Virus attaches to cilia and replicates in nasal and tracheal epithelium
  - Damage to cilia allows infection to spread to lungs
- Clinical signs include high fever, off feed, nasal discharge, pneumonia, and cough (the sign of recovery has started)
  - Some strains cause reproductive loss
  - Clinical signs last approximately 1 week
- All ages of pigs can be affected

SIV: Management

- Warm, dry, draft-free environment and supportive care
- Vaccines are available but often not effective
  - Cross protection between different strains
  - Rapid change of virus
  - Short duration of immunity
- Dams may pass antibodies to their pigs in colostrum
  - Protection through weaning is the goal

Other enteric diseases: Ileitis, Swine Dysentery, Salmonella, E.coli

- Transmission:
  - Fecal-oral transmission is the primarily route of exposure for these bacteria
  - Rodents (Swine Dysentery)
- Environmental stability: Varies
  - Thorough cleaning and disinfection between groups is important in the control
- Clinic signs:
  - Diarrhea (hemorrhagic or not), weight loss, mortality
- Management:
  - Prevention or treatment with antibiotics
  - Vaccination (Ileitis)

What about diseases we already have?

- Reducing lateral spread of disease, spread of diseases you already have to different groups of pigs.
  - Segregation of labor
  - AIAO production by site/barn/room
  - Cleaning and disinfecting between groups
  - Cleaning and disinfecting of transport

How do we control biosecurity?

- New animal introduction
- Transport vehicles (internal and external)
- Semen
- People
- Manure hauling
- Fomites (shared equipment)
- Rodents/birds/insects/other wildlife
- Feed (ingredients and delivery)
- Dead animal disposal

New animal introduction

- Knowing the health status of the source farm
- Isolation facilities – off-site, on-site, separate labor
- Testing protocols
- Acclimatization protocols
- Transport to the main farms
- AIAO for isolation facilities
Transport

• This is probably the biggest risk, or at least takes the most blame because people usually monitor new animal introduction fairly closely
• Internal transport vs. external transport
• Truck wash – public vs. private
• Trailer bakers
• Filtration
• Monitoring protocols

Semen

• Know the stud sources and protocols for new boar introduction
• Testing protocol for the studs
• Delivery protocol for semen delivery vehicles
• Protocol for semen drop off on your farm
• Protocol for communication when there is a breakdown in biosecurity or positive test result

People

• Regular labor force
  – How will they enter and leave the farm every day?
  – Who will train new employees?
  – Who will monitor and enforce?
• Veterinarians – rules for entry, diagnostics
• Servicemen, Inspectors – rules for entry
• Delivery vehicles (UPS, USPS, FedEx) - protocol
• Visitors – NONE, or highly monitored
• County fairs, shows, etc… - Discuss the rules with all who apply

Biosecurity tools for people

• Biosecurity protocols run the gamut from:
  • Down time – length of time between contact with other pigs
  • Temping labor force – people record their own body temp before entering the farm
  • Shower in, shower out – complete change of clothes with a shower
  • Danish entry – change of footwear, coveralls, disinfect hands
  • Shuttle system – farm employees have an entry/shower-in site and are shuttled by bus to the main farm
  • Change of footwear only
  • Footbaths – disinfectant in a pan to dip boots in
  • No protocol

Manure Hauling

• Shared equipment
  – Sequencing from tested negative to known positive sites
  – Allowing for increased down time for cleaning and disinfecting and drying
• Personnel
  – Have a clear “line of separation” between haulers and pig farm labor
• Aerosolized pathogens?
  – Being aware of proximity to other facilities
Fomites

- Tools, cell phones, lunch boxes – have a protocol for disinfection upon entry, disinfectant chamber, UV light, rules on pork products
- Shared equipment such as a portable loading chute – have a protocol for disinfecting if shared
- Syringes
- Hog snares
- Sorting boards
- Hot shots
- Vaccine/medication

Other animals

- Rodents – aggressive control
- Insects – concern for blood borne transfer
- Birds
- Coyotes/raccoons/possum/skunk
- Farm cats/dogs
- Feral pigs

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Feed

- Delivery vehicles from the mill
  - Protocol for sequenced delivery
  - Routes to farms
  - Driver biosecurity
- Feed ingredients – strong evidence showing transmission of PEDv via porcine blood products
- Biosecurity at the feed mill
  - How many farms are they supplying
  - Traffic in the mill for delivery of ingredients and loading of trucks
  - People traffic

Dead animal disposal

- Compost management
  - Water
  - Pest management (coyotes, dogs, cats, rats)
  - Is there enough carbon (straw, wood chips, etc...)
- Dead pit – properly covered
- Incineration - timely
- Rendering – need to assess risk, protocol

Regional biosecurity

- To strengthen the biosecurity measures implemented on your property, consider including biosecurity issues and activities in a region.
- Biosecurity threats to all properties in your region can be minimized through a collaborative approach.
- Promotion of biosecurity at the regional level is enhanced through:
  - broad engagement of the community
  - understanding the region’s vulnerability, the source and nature of threats
  - knowledge of the skills base and resources available to the region
  - a commitment from stakeholders to implement biosecurity measures, surveillance and reporting that is shared.
- Implementation of farm biosecurity helps regional biosecurity, which in turn helps national biosecurity.

Animal disease move with the body fluids of animals: urine, feces, saliva, and respiratory secretions.

Biosecurity is all about putting up roadblocks to this movement.
Implementing and Auditing

• Animal monitoring
  – Isolation
  – Routine
  – Sick animals

• Facility monitoring
  – Water
  – Feed
  – Facility

• Transport monitoring
  – Swiffer testing
  – Baker temp monitoring

Implementing and Auditing

• People monitoring
  – We have no interest in monitoring the personal lives of the labor force (who they associate with, where they go, where they sleep at night, etc...).
  – People do not like to be nasal swabbed or have their blood drawn.
  – GPS tracking is not practical or legal.
  – We can’t confine them to living at the farm 24/7 (although this works in China).

Implementing and Auditing

• People monitoring
  – The best method is to EDUCATE people about biosecurity so they understand the issues.
  – Meet frequently to discuss potential biosecurity issues.
  – Empower them to stop any action that doesn’t fit the biosecurity protocol as they understand it.
  – Be open to questions and encourage them to ask!
  – Do not assume that everyone understands the risks like you do.

Measuring the benefits

• Avoiding the disease is obviously the best benefit as having more pigs and/or heavier pigs during a profitable hog cycle pays dividends!

• Cost of disease
  – Mortality
  – Decreased performance — lighter market weights

Questions?