Seeking solutions. Facilitating the sharing of knowledge. Encouraging co-operation.

OSHAB
Ontario Swine Health Advisory Board
PRRS THE CHALLENGE

Goals: Control, Eliminate, Monitor, Eradicate

Seeking solutions. Facilitating the sharing of knowledge. Encouraging co-operation.
HOW?

• Knowledge
• Communication
• Collaboration
• Determination
• Understanding
• TOOLS

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PRRS Control and Elimination Tool Kit

- Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) Control Program
- PRRS Elimination Programs
- PRRS Monitoring Tools

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PRRS Control and Elimination Tool Kit

Introduction

• A resource for veterinarians to utilize in the control and elimination of PRRSV based on:
  - Current knowledge
  - Scientific research
  - Field trials
  - Protocols
• Success rates 91-100% in elimination of PRRSV (Dee et al, 2001; Dubois, 2007)
PRRS OUTBREAK

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ENDEMIC PRRS

- Positive herds that continue to produce viremic pigs
- These are populations with variable individual immunity
PRRS Elimination Programs

Requires that:

• Immunity levels are maximized
• Challenge levels are minimized
• Re-infection is prevented
Objectives:

• Build a protective level of immunity in the pig

• PRRS virus will then be unable to maintain replication in the herd as long as no new susceptible animals added
Immunity
Homologous vs Heterologous

Homologous Immunity  Heterologous Immunity

• Protection generated by the pig’s immune system towards a strain of PRRSV that the pig HAS previously been exposed to

• Protection generated by the pig’s immune system towards a strain of PRRSV that the pig HAS NOT previously been exposed to.
Immunity building tools

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Commercial Modified Live Virus PRRSV Vaccines

- Usually effective in reducing clinical disease following a challenge with field isolates
- Usually not as effective in protecting against viral infection
- PRRSV genetic homology or relatedness is not a good predictor of vaccine efficacy

Use of MLV vaccines can create diagnostic confusion

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Replacement Gilt/Boar Vaccination

• Vaccination of replacement animals with commercial MLV PRRSV vaccine prior to entering a breeding herd that has a circulating field strain of PRRSV will reduce the probability of infection and shedding

• Vaccine efficacy will depend on level of cross protection
Breeding Herd Vaccination

- Commercial MLV PRRSV vaccine may be used to provide mass exposure to the sow herd.
- Results may be variable because not every PRRSV is controlled to the same degree by vaccine-induced immunity (Opriessnig et al, 2005).
- Administering a second dose one month after the initial vaccination has been used as a strategy to improve heterologous protection.
Growing Herd Vaccination

- Mass exposure to the growing pig population
- Delayed until passive immunity has waned
- Protective immunity slow to develop
- Vaccination timed 5 weeks prior to expected virus exposure
- Cross-protection may be improved if the vaccine is boosted one month after the initial vaccination
- Elimination can be achieved with mass vaccination and unidirectional pig flow!!

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Homologous immunity

- Induced by exposing the pig to the same virus it was previously exposed to.
PRRS Field Virus Exposure
Rationale and Principles

- Technique is as old as the science of vaccination
- Homologous immunity is generally more effective than heterologous immunity
- Ensures 100% exposure of all animals to the PRRSV strain taken from within that building site

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PRRS Field Virus Exposure Rationale and Principles

- Planned exposure of field virus strains to naïve animals usually produces clinical signs.
- The resulting infection will have the same severity as the natural field infection.
- Planned exposure will influence the timing of the infection in the population.
- Influences the stage of reproduction at which animals are exposed, with early pregnancy exposure preferred to late term exposure.

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Planned PRRSV Field Isolate Exposure

Uses:

1. Gilt and boar acclimation
2. Whole or partial herd exposure during an outbreak
3. Whole or partial herd exposure in herds that occasionally produce viremic pigs at birth
PRRS Field Virus Exposure
Rationale and Principles

Disadvantages:
1. Potential liability issues
2. Risk of concurrently spreading other pathogens
3. Major reproductive losses have been reported

"We've considered every potential risk except the risks of avoiding all risks."

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Live Virus Exposure: Serum Inoculation

• Harvested by collecting serum from weak born and clinically sick piglets (highest virus concentration)
• Advantage: ensures exposure to all animals
• It does not prevent virus transmission to piglets
Live Virus Exposure
Tissue Feedback

- Harvested by collecting tissues from PRRSV infected pigs
- The tissues are then fed back to other pigs in order to ensure exposure
- Difficult to quantify exposure
- Does not seem to be as widely used as it once was
Live Virus Exposure
Shedding Pigs

- Shedding pigs are placed in nose to nose contact with pigs that need to develop immunity
- Not entirely reliable
- Duration of infection and shedding is higher in young piglets than in older growing pigs or in adult breeding stock
Mitigating the Negative Effects of Live Virus Exposure

• Exposure may result in clinical signs or death in individual animals

• Antipyretic drugs such as acetylsalicylic acid (ASA) can reduce the effects of fever

• Antimicrobials such as tilmicosin may reduce death loss and reproductive losses

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Stop adding fuel to the FIRE

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PRRS Challenge Reducing Tools

Objective: Reduce the challenge dose or amount of the virus in the herd

• Reduced virus lowers the farm prevalence rate
• Lower prevalence delays age at exposure
• Older animals are more immune competent
Breeding Herd Exposure

- All sows and boars exposed at a “single point in time” become immune simultaneously
- Replacement gilts and boars can be purchased and then exposed
- Breeding herd is then closed for at least 180 days
- Commonly accepted period of herd closure is 200 days
- Field type PRRSV exposure of pregnant sows will likely cause some sow deaths and/or reproductive problems

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Encouraging co-operation.

PRRS Acclimation of the Replacement Gilt and Boar

Replacement Animal Selection

Ensure that breeding stock presents no risk of introducing new PRRSV:

• Need seronegative and PCR negative animals on entry
• History of routine testing of sufficient animals at source herd
• Biosecurity of animal transport
• Applies to all sources of boar semen
PRRS Acclimation of the Replacement Gilt and Boar

PRRS Acclimation Process

• Pre-exposure period

• Exposure period

• Post-exposure period

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PRRS Acclimation Process
Exposure Period

• Exposure by serum inoculation will be done in one day
• Vaccination with 2 doses given 1 month apart will require 1 month
• Natural exposure to infected pigs may require up to 60 days
PRRS Acclimation Process
Post-Exposure Recovery Period

- Gilts and boars should not be shedding virus upon, or after, entry into the breeding herd
- 90 day post-exposure isolation period after the PRRS exposure helps to achieve this
- A positive PRRS PCR is a strong indicator that an individual animal may be shedding virus
- A negative PRRSV PCR does not guarantee that an individual animal is not intermittently shedding virus

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Management Practices to Reduce PRRSV Challenge

- Best Management Practices
- Internal and External biosecurity
- Sanitation
- Management procedures
- Lower the amount of PRRS virus that is available in the environment
- Reduce the number of viral particles to a level below the infectious level

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McRebel™ PRRS

Management
Changes to
Reduce
Exposure to
Bacteria to
Eliminate
Losses  (McCaw, 1995)

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McRebel™ PRRS

- Simple low cost program
- Minimizing nursery and farrowing room losses
- Challenging to implement where farm staff find it difficult to resist the temptation to foster after 24 hours, or if euthanizing of piglets presents a problem
- Cannot be overemphasized that it must be adhered to until testing has confirmed successful PRRSV elimination

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Internal Biosecurity

• Control of movement of virus from infected to non-infected animals within the same population early in an acute PRRSV outbreak minimizes the number of infected weaned pigs
• Control objects that can carry the PRRSV from pig to pig – needles, tooth nippers, hog snares, shovels, brooms etc
• Stop movement on sows; use uni-directional pig flow
• Use internal “Danish entries” between infected and non-infected areas of a building
• All-in-all-out pig flow is essential
External Biosecurity

- Control of entry of new pathogens
- Air filtration has gained popularity
- Only as effective as the weakest link
- AASV PRRS Biosecurity Manual

Danish Entry – a cost effective way to reduce disease transmission

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Sanitation

- Between batches eliminate the PRRSV
- Organic material removed
- Detergent
- Efficacious disinfectants:
  - Quaternary ammonium + glutaraldehyde mixtures
  - Modified potassium monopersulfate
- Minimum contact time of 2 hours
- Areas disinfected should be heated
- Adequate downtime to allow drying
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Whole Herd Depopulation/Repopulation

- Removal of all pigs from the farm
- Disinfecting the facilities
- Restocking the farm with PRRSV negative pigs
Whole Herd Depopulation/Repopulation

Advantages
- High degree of efficacy
- Solves multiple problems at the same time
- Can result in genetic improvements
- Vast experience using the method in the veterinary industry

Disadvantages
- Costly
- Requires multiple sites for off-site breeding of new clean stock and finishing out of infected pigs
- Re-infection can occur during the repopulation process (or at any later point)

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Farrowing Depopulation

Advantages

• Does not rely on the McREBEL™ PRRS program
• Controls for human error

Disadvantages

• Lost production
Nursery and/or Finisher Depopulation/Repopulation

Advantages
- High efficacy
- Productivity gain from the one time building sanitation

Disadvantages
- Requires off-site nursery or temporary remodeling of finisher facility to accommodate young pigs or longer stay in the farrowing crates

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Herd Closure and Rollover

• Herd closure & rollover has become the most widely used method for eliminating PRRSV from sow herds
• Interrupting the introduction of incoming replacement females and males for at least 6 months
• Herd closure brings an overall improvement in health and productivity
Herd Expansion or Loading With Exposure of Replacements

• Introduction of staggered ages of replacement animals prior to closure
• No new PRRSV naïve animals need to be introduced to the breeding herd for 8 months after closure
• Replacements will be exposed to PRRSV at the same time as the breeding herd

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Herd Closure and Rollover

Advantages

• High degree of efficacy (91-100%) (Dee et al, 2007; Dubois, 2007)
• Less labour intensive than Test & Removal (TR) or Wean & Removal (WR)
• Does not require excessive removal of breeding animals
• Less expensive than depopulation, TR or WR

Disadvantages

• Might require off-site breeding facilities
• Requires a long time to complete
PRRS Monitoring Tools

Objectives:

• Detection of PRRSV infection
• Monitor the success of a PRRSV elimination program
Post-Elimination Monitoring

- Routine serologic monitoring
- Sentinels
- Naïve seronegative replacement
- Growing pigs
- Monthly basis
- Adequate statistical power
Testing to Establish a Successful PRRSV Elimination

ELISA

• 96.6% sensitivity and 100% specificity
• Singleton reactors should be confirmed as negative by an indirect fluorescent antibody test (IFAT)
• PRRS PCR should be conducted to eliminate the possibility of very recent infections
• Resampling the animal and pen mates at a further date (at minimum 10 days later)
• Maternal antibodies do not reflect recent or current infections
Testing to Establish a Successful PRRSV Elimination

PCR – On Serum

• Real-time RT-PCR sensitivity of 95.5% was reported while a sensitivity of 100% was reported for the SYBR Green RT-PCR
• Both false positive and false negative results occur
• Common practice to pool individual serum samples
• Decreases the pool sensitivity to 84.5% for pools of 5:1 and 82.0% for pools of 10:1
• Herd level sensitivity and specificity can be 100% for both 5:1 and 10:1 pools
Testing to Establish a Successful PRRSV Elimination

PCR – Oral Fluids

• Collected by allowing the pigs to chew on a cotton collection rope
• Harvested and tested by PCR
• Pigs only test positive when PRRSV is actively circulating in the blood stream or being shed in oral fluids

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Use of Sentinels

- Sentinel animals should be commingled with seropositive animals
- Sentinels should be distributed evenly within the seropositive population

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