

## Disease Transmission Via Semen



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## Is there a disease transmission risk when using off farm semen?

- YES
  - Which diseases?
- REPRODUCTIVE DISEASES
  - Parvovirus
  - Leptospirosis
  - PRRS
  - Brucellosis.....



## Exotic Viral Diseases

- Classical Swine Fever (Hog Cholera)
- African Swine Fever
- Vesicular diseases
- Pseudorabies



Am Vet Med Assoc. 1984 Sep 1;185(5):511-6.

### Swine diseases transmissible with artificial insemination.

Thacker BJ, Larsen RE, Joo HS, Leman AD

- The transport of fresh and frozen semen to be used for artificial insemination creates a mode of disease transmission between farms.
- Methods to minimize bacterial contamination of semen include sanitary collecting and processing of semen, isolation of boars from certain pathogens, and the addition of appropriate broad spectrum or combination antibiotics to the semen.
- The likelihood of disease transmission is greater with the introduction of a boar into a herd than through the use of fresh or frozen semen.
- We believe that artificial insemination allows for the introduction of new genetics into a breeding program, with minimal risk of disease transmission.

## What can we do to minimize risk

- National biosecurity
- National regulation of Boar studs
- Boars need to be:
  -  Canadian Food Inspection Agency / Agence canadienne d'inspection des aliments
  - Leptospira negative
  - Brucella negative
  - Pseudorabies negative
- Forced Quarantine
- Stud hygiene
- Antibiotics in extender

### J Vet Diagn Invest. 2001 Mar;13(2):133-42. Detection and duration of porcine reproductive and respiratory syndrome virus in semen, serum, peripheral blood mononuclear cells, and tissues from Yorkshire, Hampshire, and Landrace boars.

Christopher-Hennings J, Holler LD, Benfield DA, Nelson EA.

- The mean number of days (+/-SD) for the duration of PRRSV shedding in semen was
  - 51 +/- 26.9 days,
  - 7.5 +/- 4.9 days, and
  - 28.3 +/- 17.5 days
  - Landrace, Yorkshire, and Hampshire boars,

Dtsch Tierarztl Wochenschr. 1998 Sep;105(9):340-5. **[Boar semen--a possible risk factor in infection occurrence of porcine reproductive and respiratory syndrome]**

- ❑ Following inoculation of the boars, PRRS virus was shown to be present in blood from the 2nd until the 35th and 40th day p.i., respectively.
- ❑ PRRS virus could also be isolated from nasal swabs at day 6, 9, 12 and 19 and from preputial swabs at day 4, 12 and 27 after infection.
- ❑ PRRS virus could only be detected at day 19 p.i. in semen of one boar.
- ❑ No gilts infected with semen

Prev Vet Med. 2002 Feb 14;53(1-2):83-101.

**Risk factors for infection of sow herds with porcine reproductive and respiratory syndrome (PRRS) virus.**  
Mortensen S, Stryhn H, Sogaard R, Boklund A, Stark KD, Christensen J, Willeberg P.

- ❑ In 1992, the porcine reproductive and respiratory syndrome virus (PRRSV) of European type (PRRSV-EU) was introduced in Denmark.
- ❑ By 1996, the virus had spread to approximately 25% of the Danish herds.
- ❑ In January 1996, a modified-live vaccine based on the American type of the virus (PRRSV-US) was used in replacement boars for Danish artificial insemination (AI) centres and from July 1996, the vaccine was used in PRRSV-EU infected herds for prevention of disease.

Vet Microbiol. 1997 Feb;54(2):101-12.

**Examination of virus shedding in semen from vaccinated and from previously infected boars after experimental challenge with porcine reproductive and respiratory syndrome virus.**

Nielsen TL, Nielsen J, Have P, Baekbo P, Hoff-Jorgensen R, Botner A.

- ❑ Soon after vaccine introduction, PRRSV non-infected herds experienced outbreaks of disease due to infection with PRRSV-US.
- ❑ The hazard of infection increased significantly with exposure from PRRSV-US-infected neighbouring herds, purchase of animals from herds incubating PRRSV-US infection, increasing herd size and purchase of semen from boars at PRRSV-US-infected AI centres.
- ❑ The results are consistent with the modified-live vaccine strain spread to other herds by trade with animals and semen and by neighbour (area) transmission. We suggest that virus spread by aerosols was a frequent mode of transmission.

- ❑ Danish artificial insemination (AI) centres house several boars antibody positive to porcine reproductive and respiratory syndrome virus as well as PRRSV-naive boars which may become acutely infected.
- ❑ The risk of transmission of PRRSV by semen may therefore constitute a serious problem to the Danish pig industry. The use of a vaccination-program may be a way to avoid or reduce the problem. This study evaluates the use of two vaccines:

- ❑ A pronounced reduction in viremia and shedding of virus in semen was demonstrated by use of the live vaccine compared to the non-vaccinated control animals. In contrast, no changes in onset, level and duration of viremia and shedding of virus in semen were observed using the inactivated vaccine.
- ❑ Neither viremia nor seminal shedding of virus was detected in previously PRRSV-infected, PRRSV-antibody positive boars after challenge with a Danish field strain of PRRSV.

## Practical implications

- ❑ Semen carries some risk
  - If herd is already positive, clinical signs and risk is lower – unless there are viral strain differences
- ❑ Vaccination of Boar studs makes sense because it reduces viral shedding risk, but risk is not gone
- ❑ Strain differences?

## PRRS negative Stud

- From PRRS naïve herds
- Good biosecurity
- In principle Assurance of no transmission
- But
  - All animals are naïve
  - Will shed in high numbers if virus is introduced
- Safer but more fragile system

## PRRS negative herd

- Different risk
  - Live animal risk and biosecurity risk already minimized
  - But need new genetics
  - Semen is the most practical way to introduce new lines, but carries some risk
  - There are no black and white answers to the problem
  - Herd specific solution

## Our approach (PEI)

- 80% of overall population is negative
- Breeding herds are negative
- boar stud
  - Only PRRSv negative boars from naïve herds
  
- Majority of semen used is domestic (island)

## New genetic introduction

- Only by semen
- Recommendation
  - Purchase from PRRS negative studs
  - PCR testing of semen prior to use
  - Breed and test in an offsite quarantine herd

J Vet Med Sci. 2003 Jun; 65(6): 741-4.

- **Simultaneous detection and differentiation between porcine circovirus and porcine parvovirus in boar semen by multiplex seminested polymerase chain reaction.**

**Kim J, Han DU, Choi C, Chae C.**

This multiplex seminested PCR assay was sensitive, rapid and a good alternative method for the detection and differentiation of these viruses in boar semen.



Prev Vet Med. 2003 Nov 12; 61(3):209-25.

**Risk factors for porcine post-weaning multisystemic wasting syndrome (PMWS) in 149 French farrow-to-finish herds.**

Rose N, Larour G, Le Diguerher G, Eveno E, Jolly JP, Blanchard P, Oger A, Le Dimna M, Jestin A, Madec F.

- A cross-sectional study involving 149 farms was carried out in France in 2000 and 2001 to assess the risk factors for post-weaning multisystemic wasting syndrome (PMWS).
- In the first comparison, the odds of PMWS were increased when fattening pigs tested positive for parvovirus (PPV) and porcine reproductive and respiratory syndrome (PRRS) virus (OR=4.4 and 6.5, respectively).
- when separate vaccines for parvovirus and Erysipela for the gilts versus associated vaccines were used (OR=2.5),
- and when on-farm semen collection was used versus all the semen purchased from an insemination centre (OR=4.6).
- On the other hand, when farms had a self-replacement scheme for the gilts (OR=0.1), and when vaccination of the sows against E. coli was in place (OR=0.2), the odds of PMWS were decreased.

: J Clin Microbiol. 2000 Dec; 38(12):4629-32.

**PCR detection and evidence of shedding of porcine circovirus type 2 in boar semen.**

**Larochelle R, Bielanski A, Muller P, Magar R.**

Laboratoire d'Hygiene Veterinaire et Alimentaire, Agence Canadienne d'Inspection des Aliments, Saint-Hyacinthe, Quebec,

- An experimental study was conducted to evaluate the potential presence of porcine circovirus type 2 (PCV2) in the semen of infected boars.
- Following infection, PCV2 DNA can be detected in semen concurrently with the presence of PCV2 DNA and antibodies in the serum. The present study suggests that PCV2 may be shed intermittently in the semen of infected boars.

