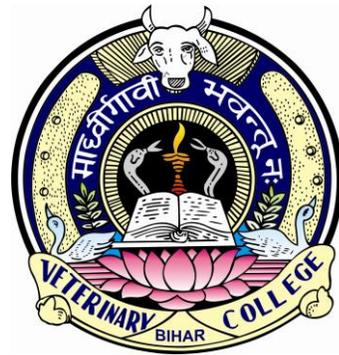




Bihar Animal Sciences University



Course no. VMC 321  
Systematic Veterinary Virology

## Online lecture

Topic:

*“Pseudorabies virus”*

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# Pseudorabies virus (PRV)

Aujeszky's disease

▪ Family : *Herpesviridae*

▪ Sub family :  
*Alphaherpesvirinae*

▪ Genus:  
*Varicellovirus*

▪ Species:  
Porcine Herpesvirus 1



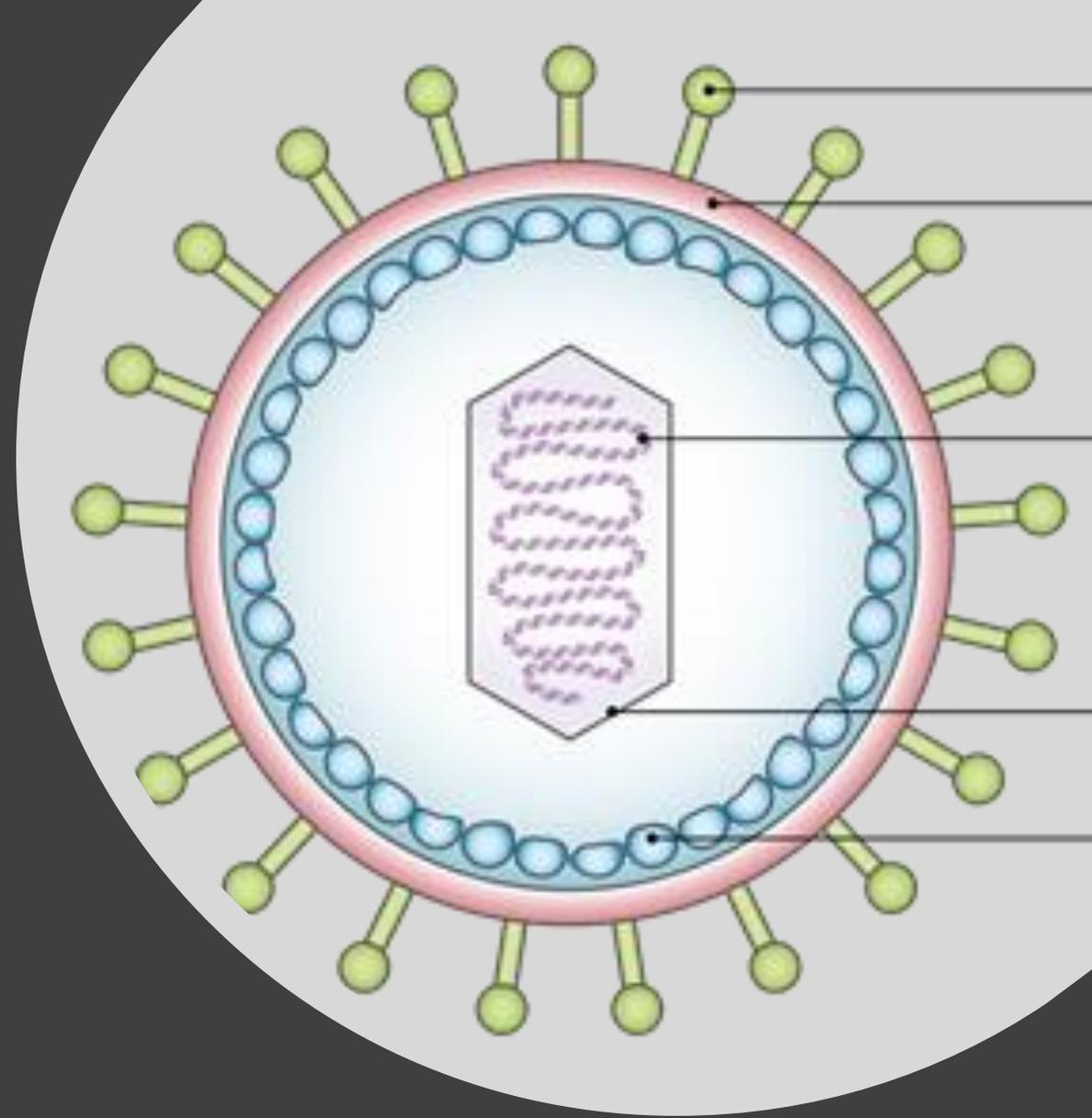


Pseudorabies virus (PRV) is a contagious herpesvirus that causes reproductive problems (abortion, stillbirths), respiratory problems and occasional deaths in breeding and finishing hogs.

# *Suid herpesvirus 1*

(Syn : Porcine Herpesvirus 1 ; Aujeszky's Disease Virus)

- **Species:** Porcine Herpesvirus 1
  - Single serotype
  - *Su HV-1* is 150 – 180 nm sized virion
  - Composed of a 145 Kbp linear double - stranded DNA genome.
  - The 105 – 110 nm wide nucleocapsid
  - Sensitive to ether , chloroform, formaldehyde etc.
  - Inactivated at 37 °C





# *Suid herpesvirus 1*

(Syn : Porcine Herpesvirus 1 ; Aujeszky's Disease Virus)

- **Species:** Porcine Herpesvirus 1

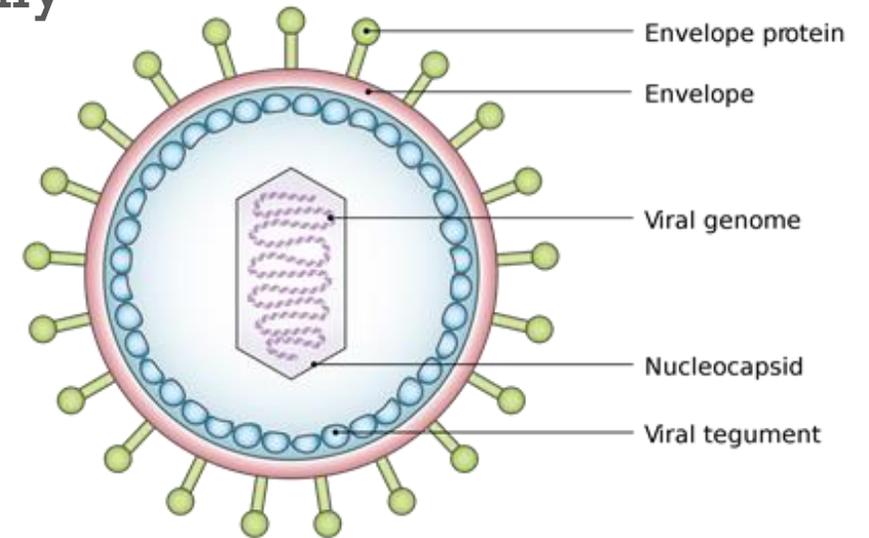
- Pseudorabies virus (PRV) is an enveloped, double-stranded DNA virus belonging to the family *Herpesviridae*.

- Single serotype

- Su HV-1 is 150 – 180 nm sized virion

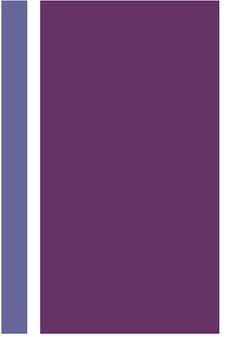
- The 105 – 110 nm wide nucleocapsid

- Composed of a 145 Kbp linear double - stranded DNA genome.





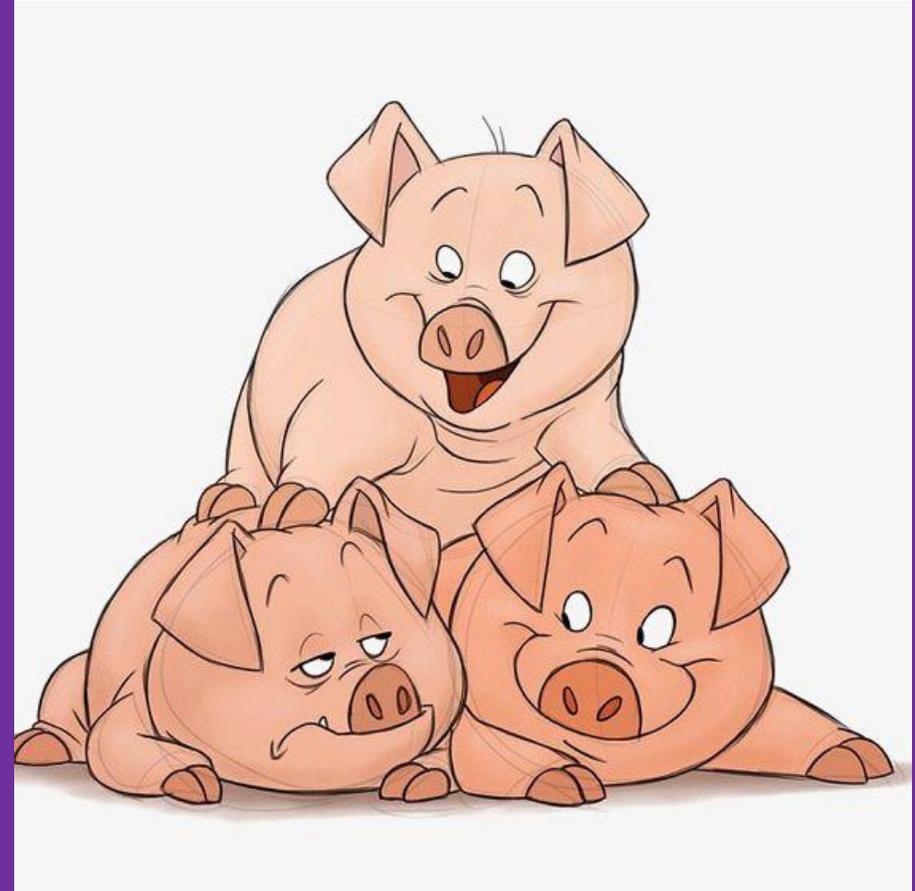
# Cleaning and Disinfection



- PRV is stable over a pH range of 4–12 and can remain infectious at cold temperatures for weeks.
- The virus is inactivated at high temperatures.
- PRV is reportedly susceptible to disinfectants including:
  - orthophenolphenate compounds
  - peracetic acid
  - formalin
  - 2% sodium hydroxide
  - trisodium phosphate iodide disinfectants
  - 1–2% quaternary ammonium compounds
  - Sodium hypochlorite (bleaching powder),
  - chlorhexidine.

# The Disease

Pseudorabies /Aujeszky's Disease



# History

- 1902
  - Aládar Aujeszky, Hungary
  - First identified in cattle and dogs
  - Determined swine were natural hosts
- 1931: “mad itch” same as Aujeszky’s disease



# What is Pseudorabies?

- **Pseudorabies is a neurological disease of swine** can also affect cattle, dogs, cats, sheep, and goats. Infected new born pigs may exhibit central nervous system clinical signs.





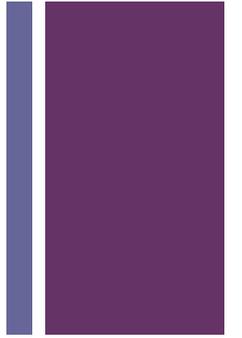
# Aujeszky's disease or pseudorabies or Mad itch (Historical background)

- Aujeszky 's disease (**PSEUDORABIES**), pseudorabies or ' **mad itch** '
  - neurological/respiratory disorder
  - affects a wide range of animals – pig, cattle, dogs, cats, sheep, and goats
- PRV was first described in cattle in the 1800s with '**mad-it**ch'
  - a syndrome marked by intense scratching and self-mutilation at the site of virus entry
  - Later the term pseudorabies was used.
- By the early 1900s, physician **Aladár Aujeszky** isolated the virus from cattle, dogs, and cats, and the disease became widely known as **Aujeszky's disease**



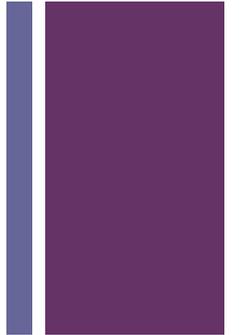


# Aetiology



- Porcine or Suid herpesvirus type 1 (SuHV-1), also known as *pseudorabies virus (PRV)* or *Aujeszky 's disease virus (ADV)*, which belongs to the family *Herpesviridae* in the genus *Varicellovirus*.
- Two strains of virus
  - 'Classical' PRV strains
  - 'Variant' PRV strains

+ 'Classical' PRV strains



# Four genotypes

Type I (USA)

Types II and III (Central and North Europe),

Type IV (Asia)

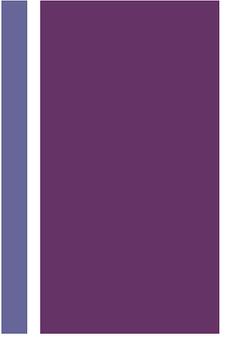


## Aujeszky's disease or pseudorabies or Mad itch

- **Susceptibility of the animal host**
  - **Pigs** are the **natural host** for Aujeszky's disease virus and the only animals to become **latent carriers**.
  - virus can infect nearly all **domesticated** and **wild mammals** including **cattle**, **sheep**, **goats**, **cats** and **dogs**.



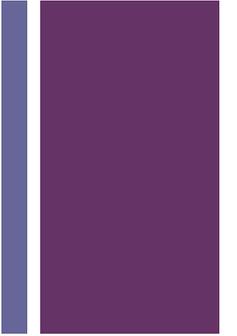
# Secretion and excretion from the source



- Su HV-1 is excreted in suids by
  - nasal exudates
  - saliva
  - vaginal mucus
  - sperm
  - milk
  - faeces
  - occasionally urine



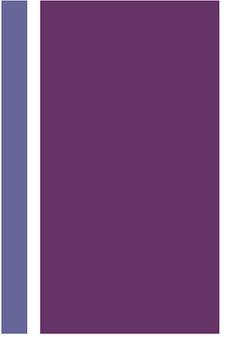
# Transmission



- Direct oronasal contact is the main route of transmission in domestic swine.
- Conjunctival transmission can also occur.
- **Pigs with latent infection**, showing no clinical signs, can **introduce the virus into susceptible herds**.
- PRV is transmitted vertically.
- Venereal transmission is considered to be the main route in feral swine.
- The virus is also transmitted by **air, water, and contaminated fomites**.
- Ingestion of infected meat or carcasses is linked to PRV transmission in dogs and cats, as well as free-ranging and captive wildlife.



# Infection in Swine/Pathogenesis



- In latently infected pigs, PRV persists primarily in the trigeminal ganglia (the predominant site in domestic pigs), the sacral ganglia (the predominant site in wild pigs), and the tonsils.
- In domestic pigs, CNS signs are most common in suckling pigs, but sudden death can also occur.
- In older, growing pigs, respiratory signs such as dyspnea and rhinitis can be seen. Reproductive failure is common in breeding herds.
- Wild pigs seldom exhibit signs of infection with PRV

Primary viral multiplication in the cells of the nasopharyngeal mucosa

Virus gains entry into the central nervous system (CNS) via various cranial nerves

Virus transfer along nerve fibres takes place within the axoplasm and through Schwann's cells and fibroblasts of the endoneurium

Other pathways of viral dissemination throughout the body include the lymphatics

Further viral multiplication occurs in lymph nodes

Virus enters the vascular system carried by phagocytes

Pseudorabies virus proliferate in capillary endothelium, ganglion cells, satellite cells, Schwann's cells, lymphocytes and macrophages

# Pathogenesis

- Oronasal infection, primary replication occurs in the upper respiratory tract
- Virus then invades sensory nerve endings in the face and oropharynx, including the olfactory, trigeminal, and glossopharyngeal nerves
- PRV spreads to the cell bodies of infected neurons via axonal retrograde transport
- Viremia results in dissemination to other organs
- Replication occurs in epithelium, vascular endothelium, lymphocytes, and macrophages



# Dissemination of virus

- **Secretion and excretion from the source**
  - SuHV-1 is excreted in suids by
    - nasal exudates
    - Saliva
    - vaginal mucus
    - Sperm
    - Milk
    - faeces
    - occasionally urine.



# Route of infection

- Different routes of infection by SuHV-1 are potentially possible because there is some, unquantified, survival of the virus in the environment, particularly in organic material, and some persistence in aerosols.
- **Direct contact –**
  - animal-to-animal (nose-to-nose) with SuHV-1 excreting boar
  - ingestion of infected meat
  - inanimate objects, such as boots, clothing, feed, trucks, and equipment
- **Indirect contact** - with infected fomites or aerosols.

# Mode of transmission

- Transmission by the aerosol route
  - low in hot and dry weather conditions (unfavourable for the virus)
  - enhanced if weather conditions are cool and wet.
- Natural infection - by the oro-nasal
  - ruminants are infected by the nasal route
  - carnivores by the oral route.
- Suckling pigs can acquire SuHV-1 from the milk of infected sows, or infection may already have taken place in the uterus.
- Venereal transmission - primary importance for SuHV-1 transmission pig populations

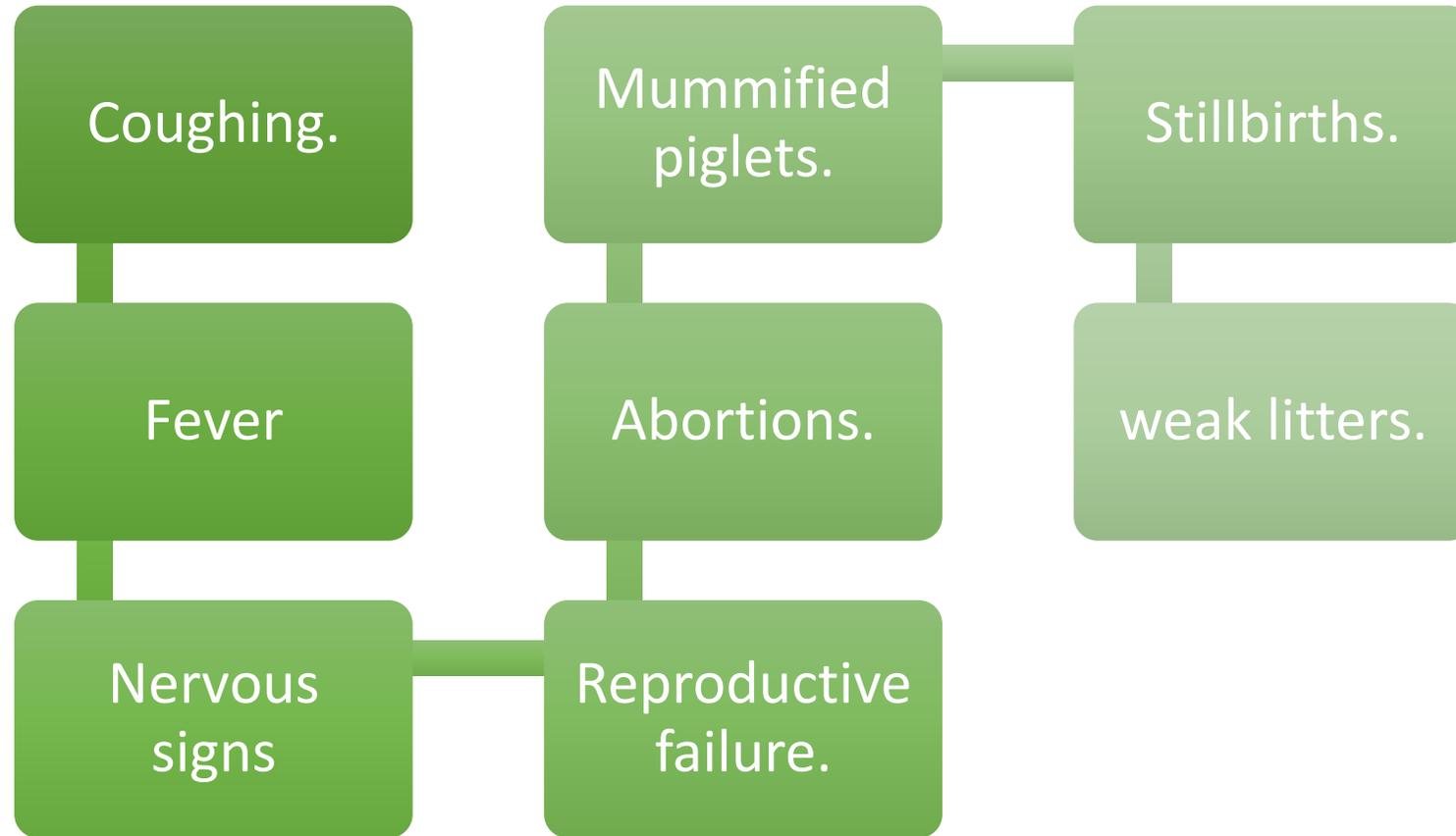
# Clinical signs - Acute disease

- The virus crosses the uterus and placenta and infects the foetus.
- Abortions, stillbirths and the birth of weak litters.
- Reproductive failure at all stages of the cycle.
- Embryos are killed and absorbed and sows return to heat.
- Dogs and cattle - show nervous signs and die.

# Clinical signs - Chronic disease

- Depression of reproductive efficiency
  - increased levels of repeats
  - mummification
  - stillbirths
  - piglet mortality
- Young carrier females - shed virus thus maintaining infection throughout the herd.

“Pigs that have recovered from PRV infection may become asymptomatic carriers.”



**Mummified pigs, a symptom of Pseudorabies**

## **Clinical signs – Sows**

Lesions on nose of piglet

# Clinical signs - Piglets

- Nervous signs.
- Incoordination.
- Sneezing.
- Coughing.
- High mortality.
- Low / poor viable piglets.



Stillbirth

# Clinical signs: Weaners & Growers

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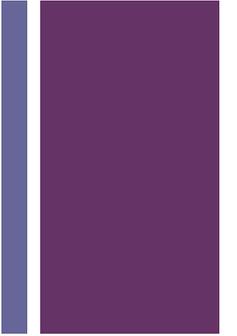
- Fever.
- Sneezing.
- Coughing.
- Pneumonia.
- Nervous signs
  - including incoordination, fits and meningitis.
- severe respiratory disease and severe rhinitis.
- Usually low mortality.



Dead pigs (and a cat), due to Pseudorabies



# Diagnosis



## ■ Clinical History

When a susceptible breeding herd first breaks down with this disease the clinical signs described above strongly suggest Aujeszky's disease and are almost diagnostic.

Laboratory tests are required to confirm the diagnosis. The common ones are as follows:

## ■ Virus isolation: from the lung and tonsils and its identification.

- ✓ virus isolation, though porcine kidney cells (PK-15, SK6) are commonly used.
- ✓ Cytopathic effect is observed within 24–72 hours

## ■ Virus antigen detection:

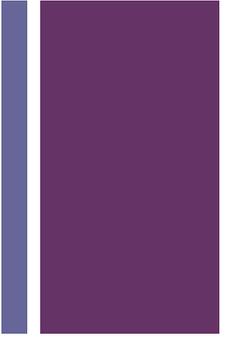
- **Immunoperoxidase or Immunofluorescence** on dead piglet tissues particularly tonsils.
- **Serology:** to demonstrate rising antibodies via anti-gE ELISA
- **PCR:** amplification with primers of conserved sequence( gB or gD genes)

# Prevention & Control

- Culling of prv-positive herds
- Vaccination programs with ‘marker’ viruses such as ge-deleted strains (**bartha-k61**, an attenuated vaccine)
- Restricted importation of swine
- Isolation of domestic swine from wild boar
- Vaccination with



“Pigs that have recovered from PRV infection may become asymptomatic carriers.”



**THANKS**