



# The Threat of Emerging & Re-emerging Swine Diseases from the US

TSVA: November 5, 2013

**EIDAS**

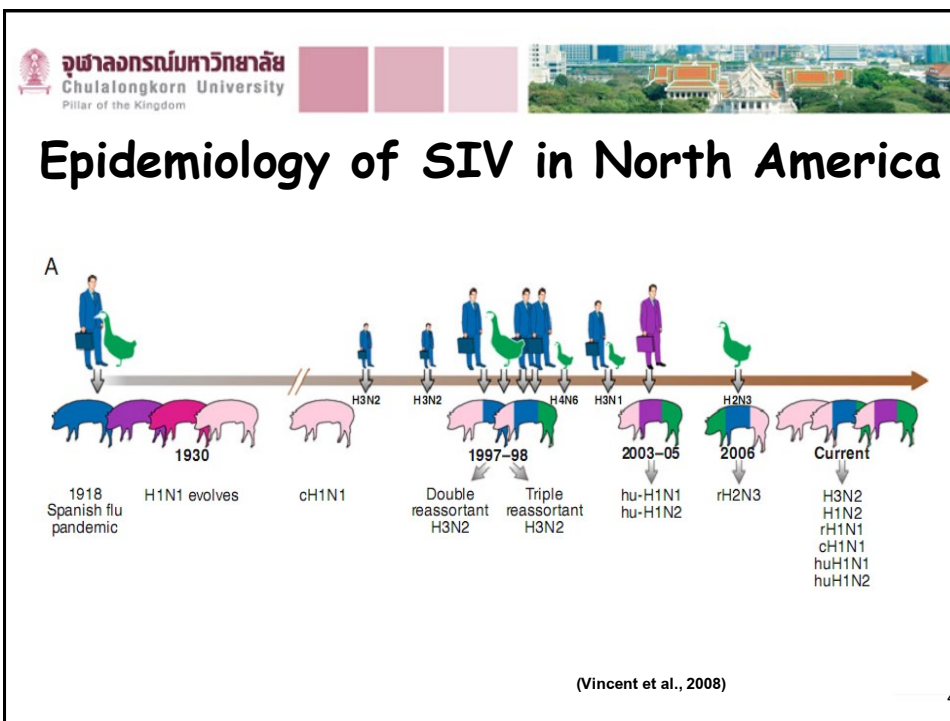
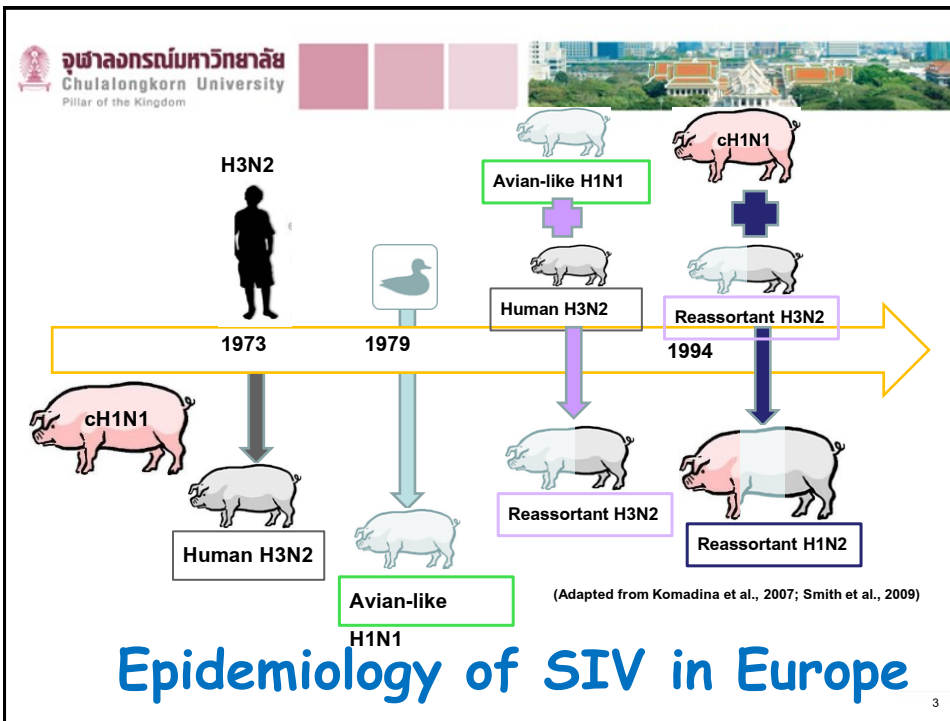
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## Major Factors contributing to EID

- **GLOBALIZATION & BIOSECURITY FAILURE**
- **HUMAN BEHAVIOR**
  - Political & Economic
  - Social & cultural
- **ENVIRONMENTAL & ECOLOGIC FACTORS**
  - Climatic changes
  - Deforestation
- **GENETIC/BIOLOGIC FACTORS**
  - Host and agent mutations
  - Increased survival of susceptible hosts





#### Europe

- Classical swine H1N1
- **Whole avian H1N1**
- Reassortment human-like H3N2
- Reassortment human-like H1N2

#### North America

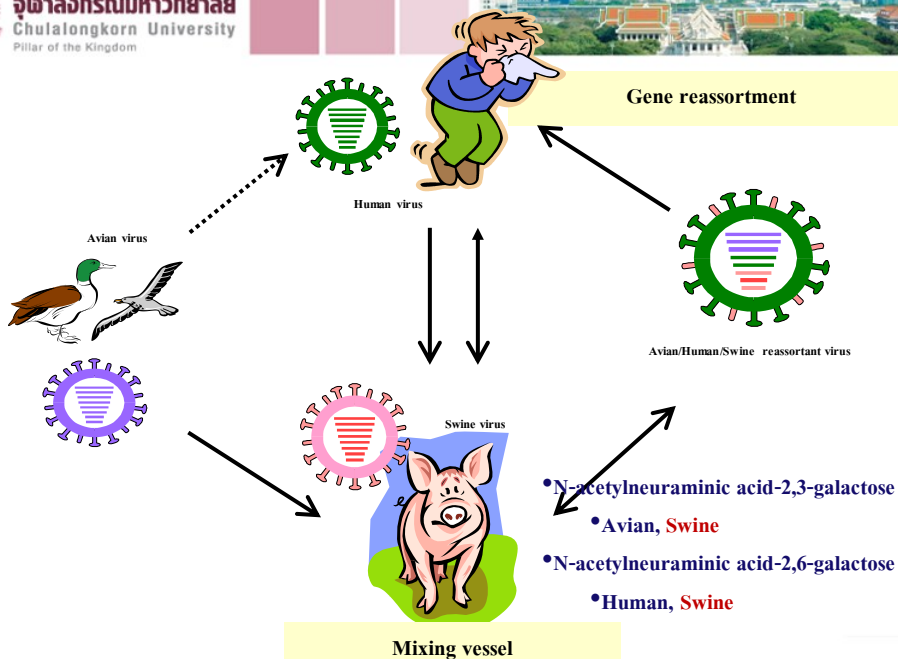
- Classical swine H1N1
- Triple-reassorted H1N1
- Triple-reassorted H3N2
- **Human H1N2, H3N2**
- Human-swine reassortant H1N2
- **Whole avian H3N3 and H1N1**

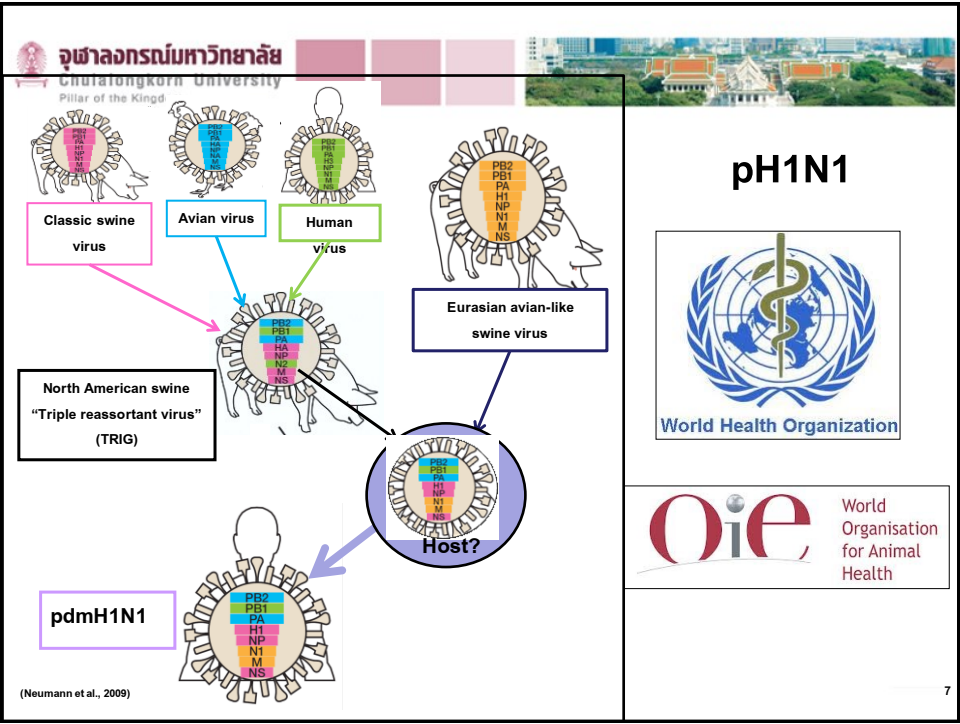
#### Asia

- Classical swine H1N1
- Avian-like H1N1
- Human-like H3N2
- Avian-like H3N2
- Human-swine reassortant H1N2
- Reassorted H3N1
- **Whole avian H1N1**
- Seroevidence to H4 & H5 (China)

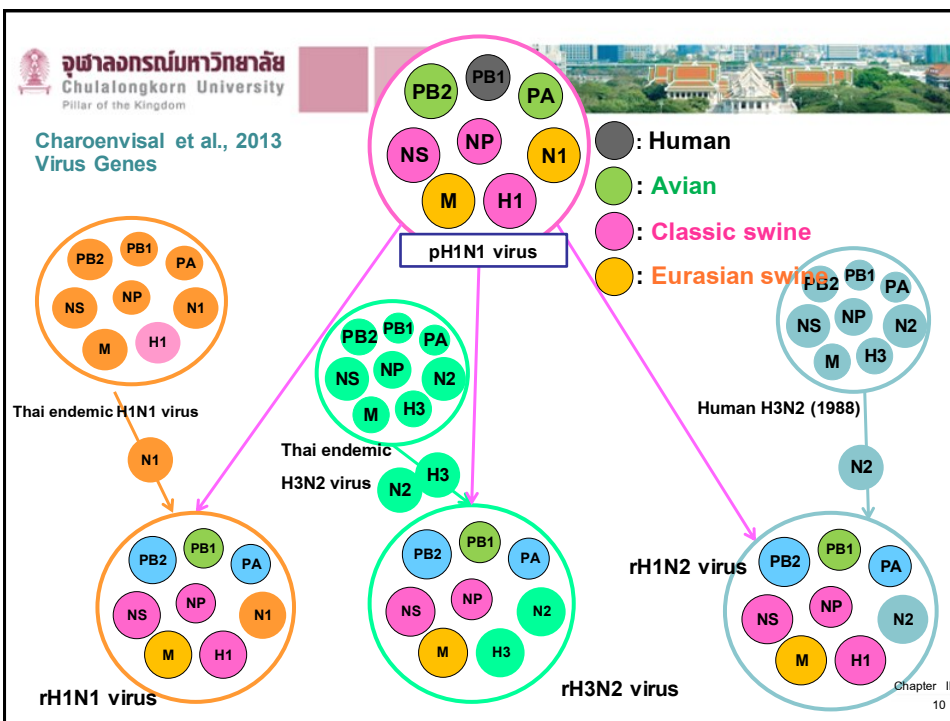
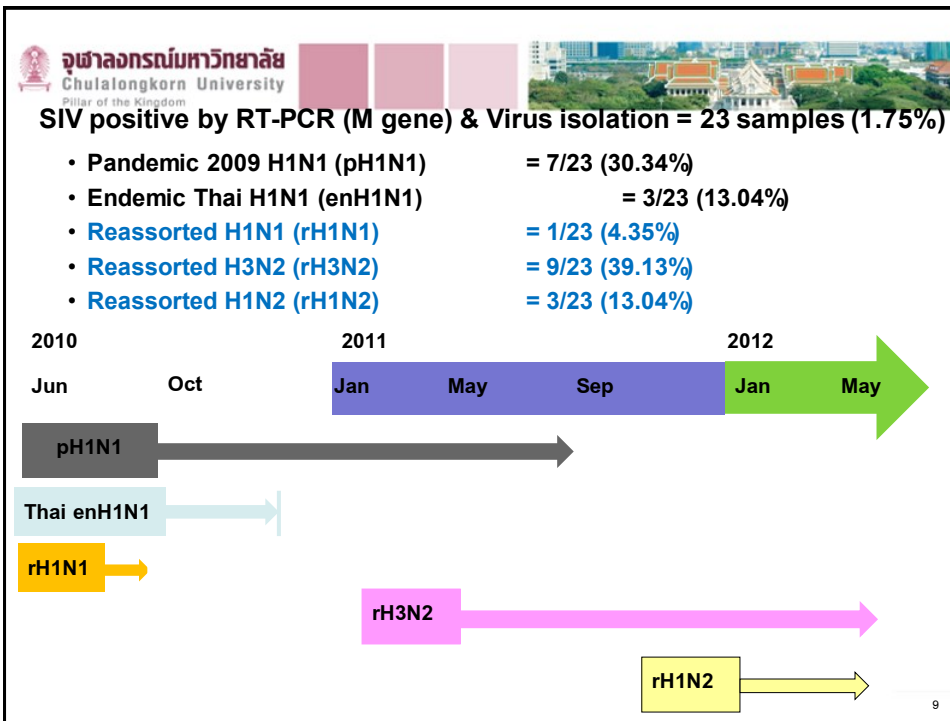
## Swine Influenza Virus

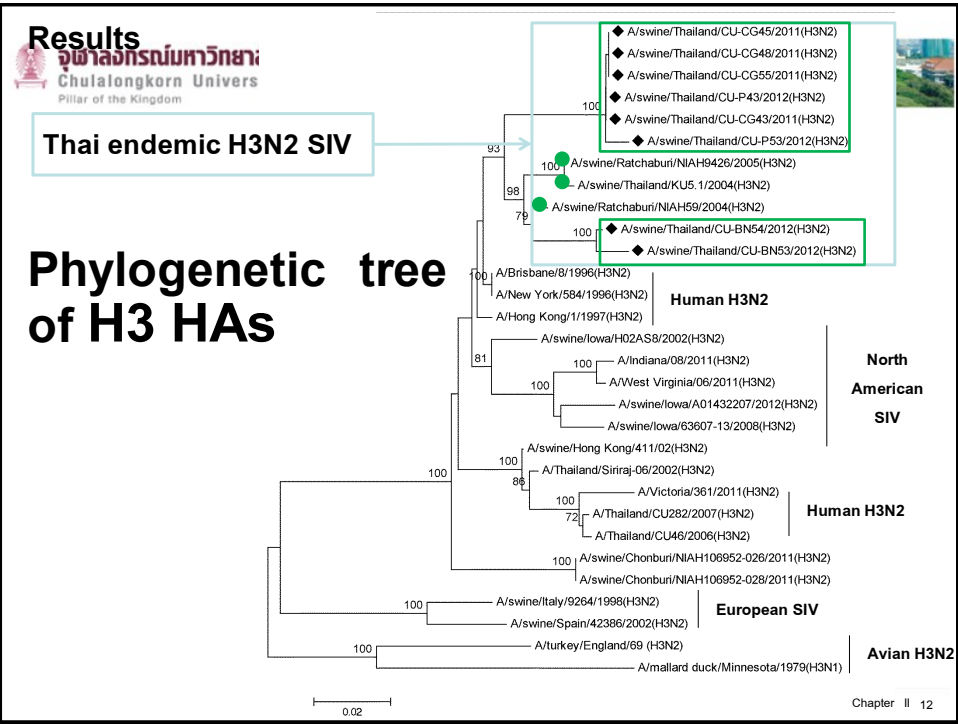
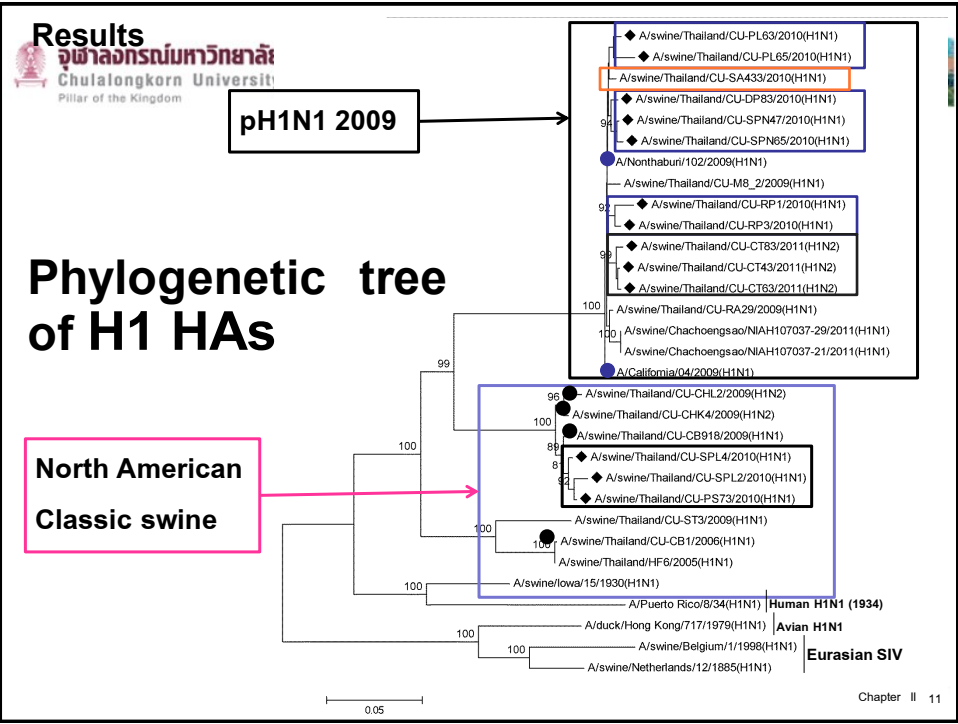
Sreta et al., 2013 JVDI





SIV genetic variation in Thailand											
Virus	Subtype	Year	TRIG	PB2	PB1	PA	HA	NP	NA	M	NS
Thai SIV	H1N1	2000	-								
Thai SIV	H1N1	2009	-								
Pandemic H1N1	H1N1	2009	+								
New reassort	H1N1	2011	+								
Thai SIV	H1N2	2005	-								
Thai SIV	H3N2	2005	-								
Thai SIV	H3N2	2004	-								
Thai SIV	H3N2	2007	-								
Human-1970s Human-1990s											

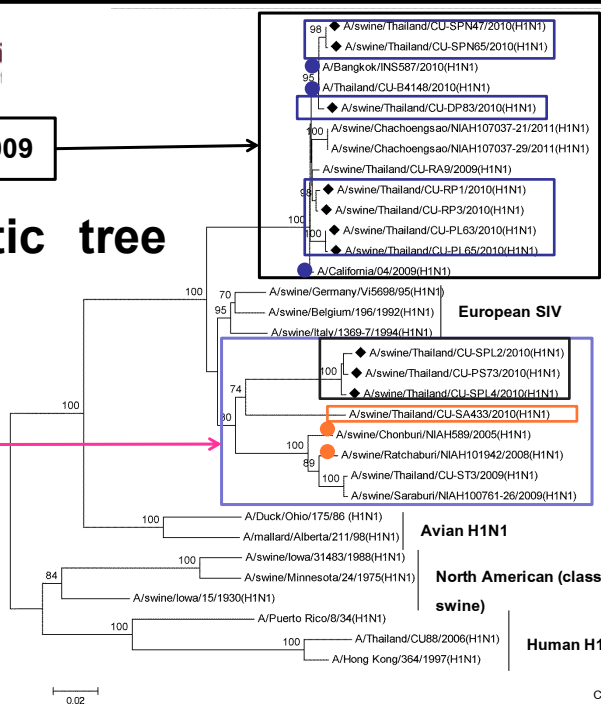




**pH1N1 2009**

## Phylogenetic tree of N1 NAs

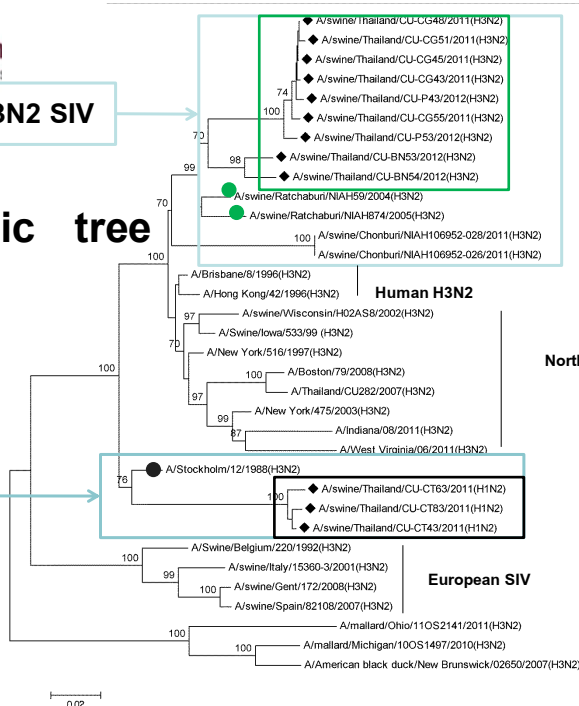
## European SIV



Chapter II 13

## Thai endemic H3N2 SIV

## Phylogenetic tree of N2 NAs

Human H3N2  
(1988)

Chapter II 14

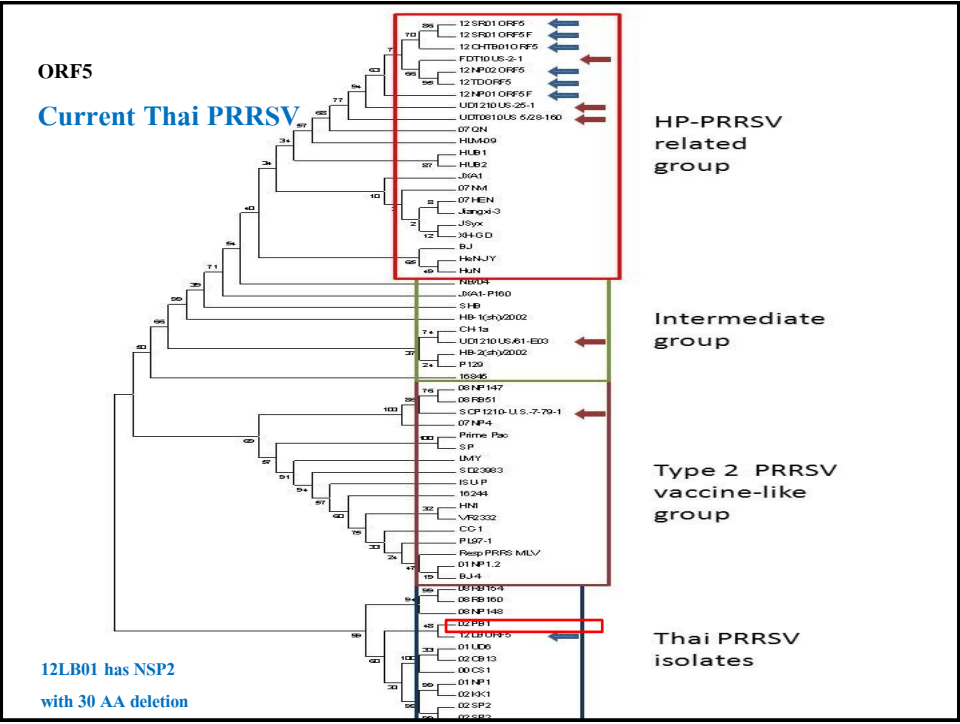
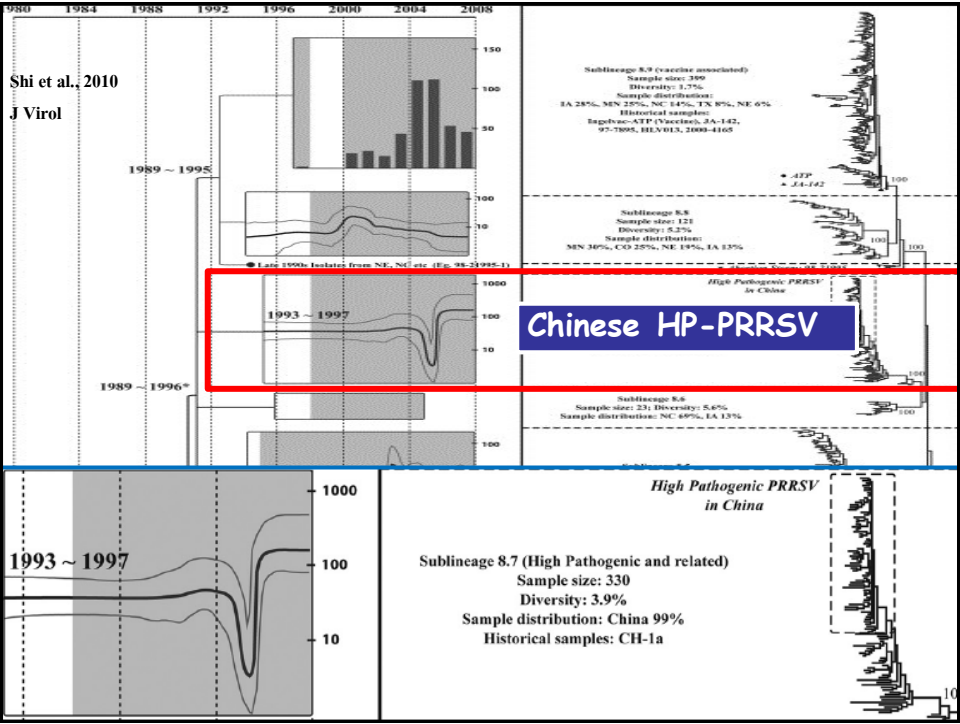



Courtesy of K. Korteerakul













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**1<sup>st</sup> reported Canada in 1991**  
(Harding and Clark, 1997)


**Thailand in 1998**  
(Tantilertcharoen et al., 1999)




Gras-Roma et al. (2010)

- PCVAD is a globally disease having a huge impact on swine-producing countries

**Chapte**

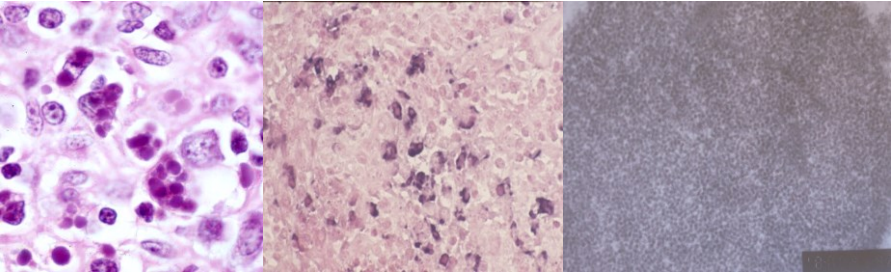


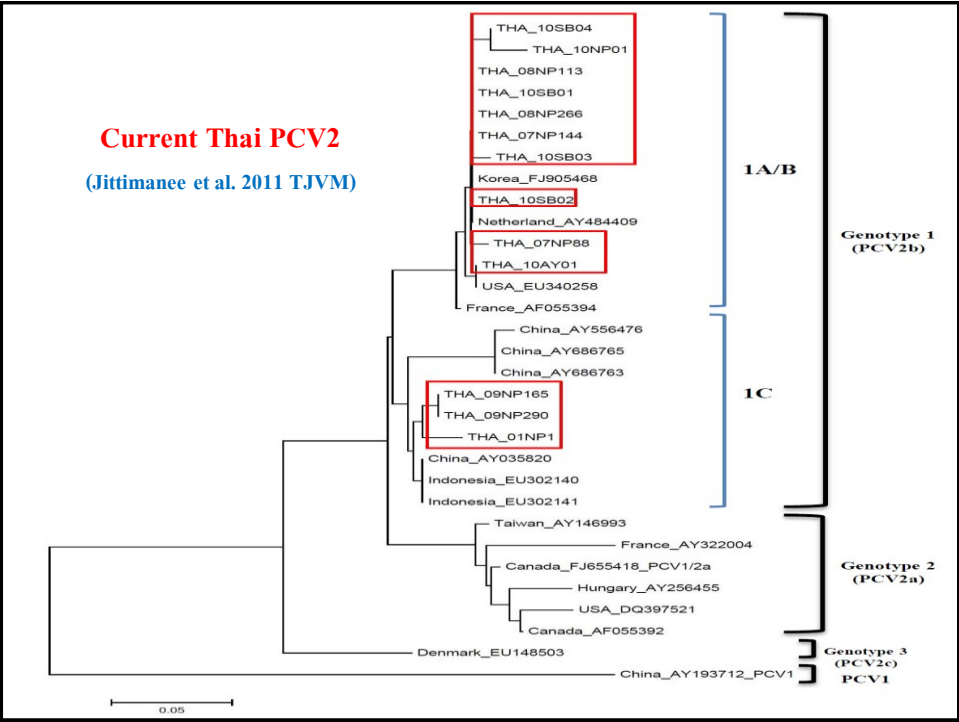
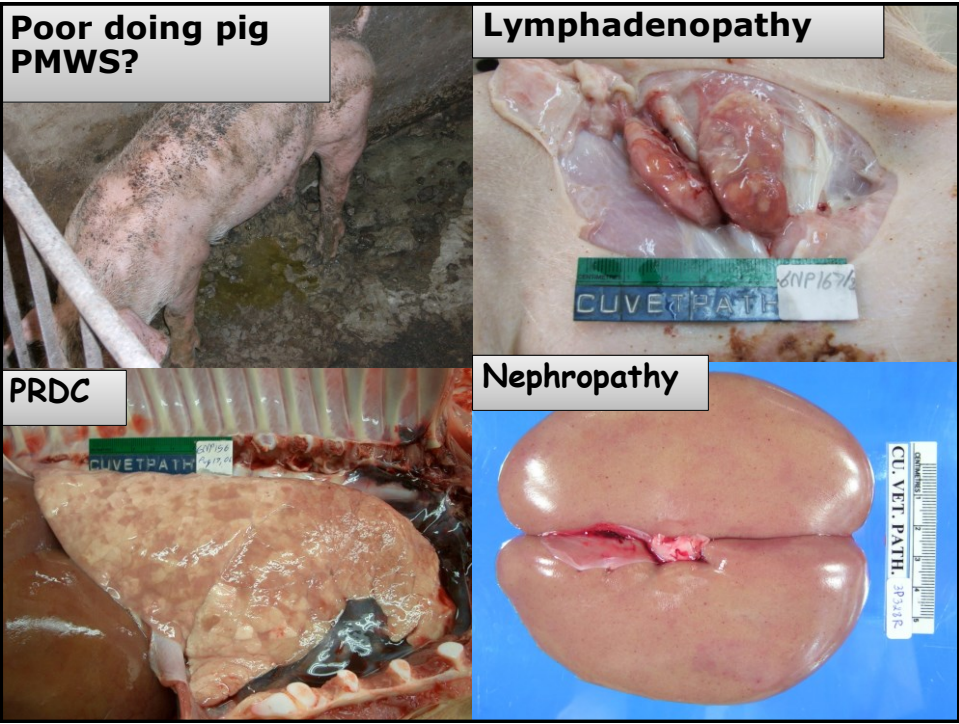
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Pillar of the Kingdom



## PCV2 in Thailand

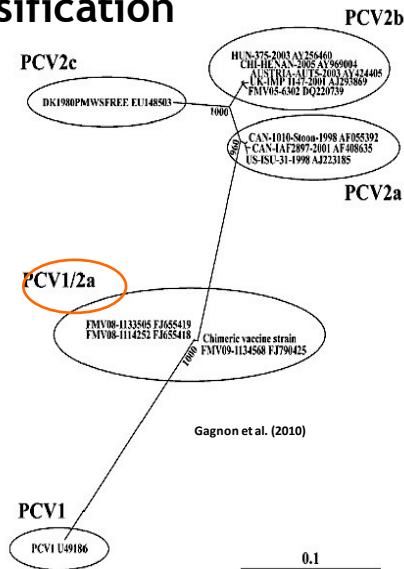
- First report in 7-9 wk-old pigs in 1998
- Retrospective study found in 1993
- Epidemic outbreaks in 2003-2005





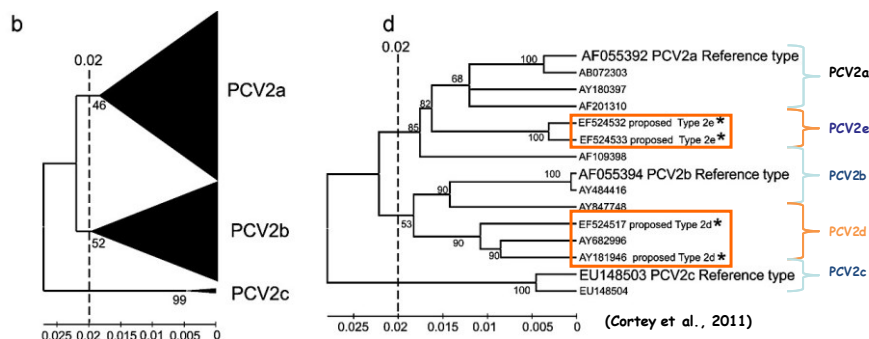
## Introduction - PCV2 Classification

- Novel PCV1/2a genome contains
  - ORF1 of PCV1
  - ORF2 of PCV2a
- Possibly originating from a Chimeric killed vaccine.
- Nucleotide substitution rate approximately  $1.2 \times 10^3$  substitutions site/year (Firth et al., 2009).
- Emerging of any new PCV2 genotype is possible in the future.



## Introduction - PCV2 Classification

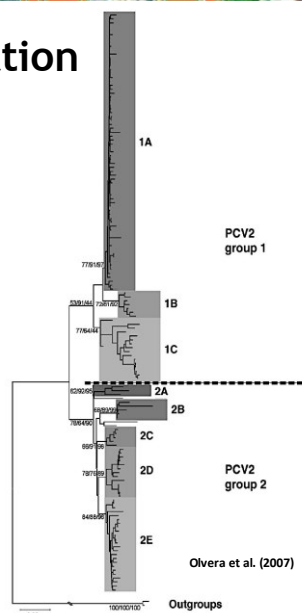
- 5 genotypes had been reported (PCV2a to PCV2e).
- 2 major genotypes: PCV2a (genotype 2) and PCV2b (genotype 1)
- PCV2c had been reported in Denmark (Segales et al., 2008).
- PCV2d & PCV2e had been reported in China (Wang et al., 2009).





## Introduction - PCV2 Classification

- 8 subgroups (Olvera et al., 2007).
  - 1A - 1C (PCV2b or genotype 1)
  - 2A - 2E (PCV2a or genotype 2)



## PEDV is widespread.

### 豬流行性腹瀉病毒是普遍存在的

- First confirmed case in the US in May 13, 2013 (April 29 in Ohio). Recover within 6 weeks!!
- Are there import/export issues?
  - PEDV is not a disease listed as notifiable by the OIE.
  - PEDV is not considered a foreign animal disease by the USDA and within the USA there are no associated interstate trade restrictions. ◦
  - At least 16 states are currently affected *Pig Progress magazine Volume 26.9 (2013).*





## Situation of PEDV in the US

- Most farms recover within 6 weeks (4-8)
- Trial on 528 trailers upon arrival found 2-14% positive using PCR.
- After loading, the negative trailers became positive from 0-10%.
- PCR from air can be positive for 16 km.
- Must be differentiated from Rotavirus & TGEV



### DISPATCHES

## Chinese-like Strain of Porcine Epidemic Diarrhea Virus, Thailand

类中国株  
猪流行性  
腹泻病毒,  
泰国

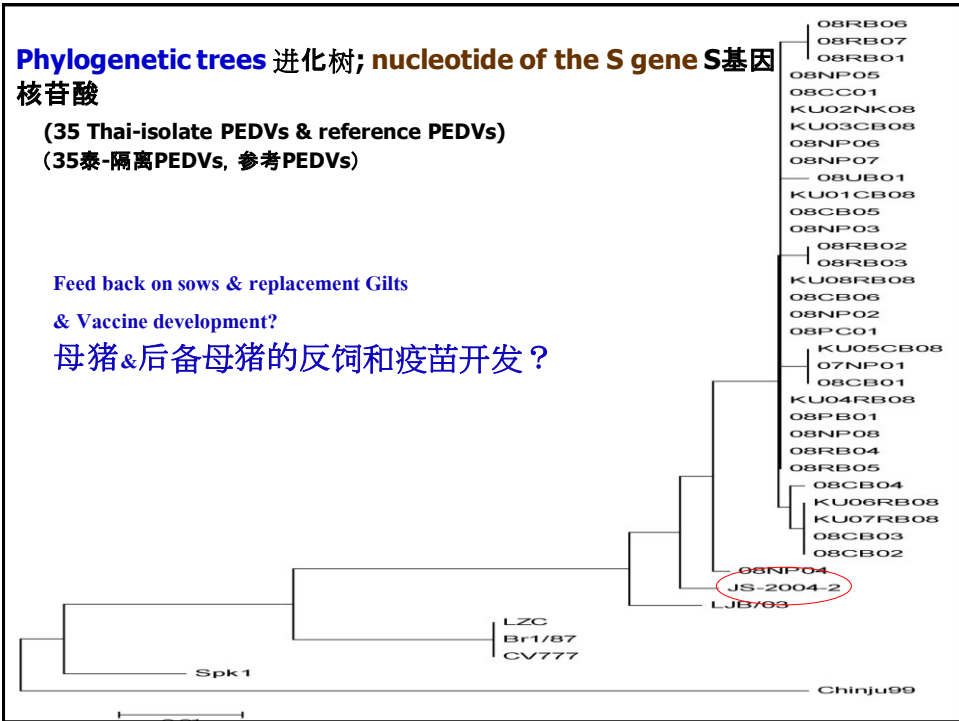
Suphasawatt Puranaveja, Pariwat Poolperm,  
Preeda Lertwatcharasarakul,  
Sawang Kesdaengsakonwut,  
Alongkot Boonsoongnern, Kitcha Urairong,  
Pravina Kitikoon, Porjit Choojai,  
Roongtham Kedkovid, Komkrich Teankum,  
and Roongroje Thanawongnuwech

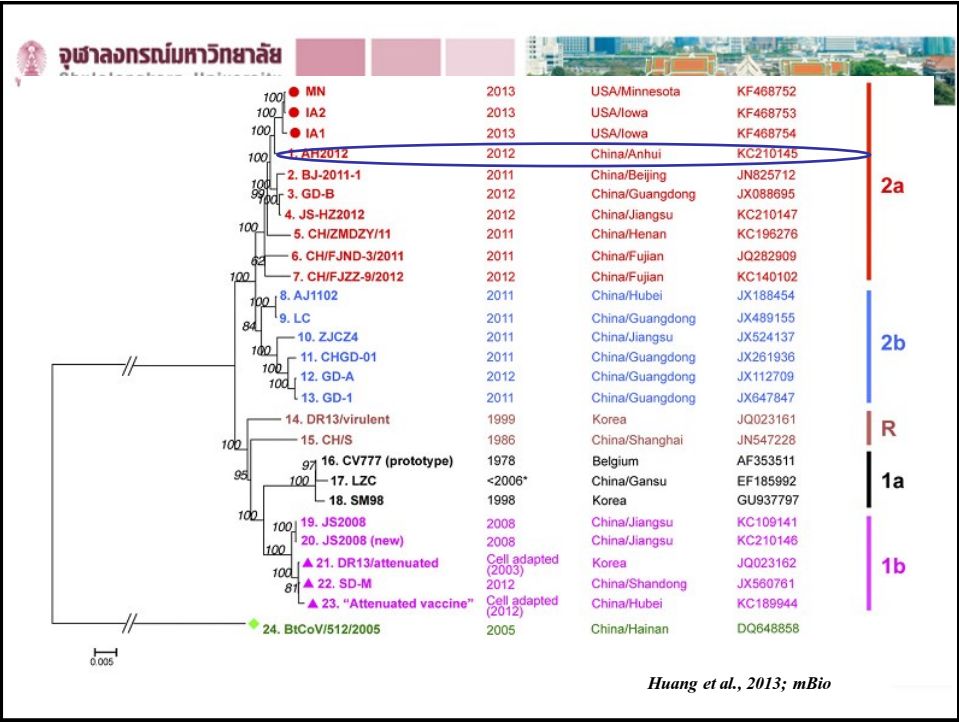
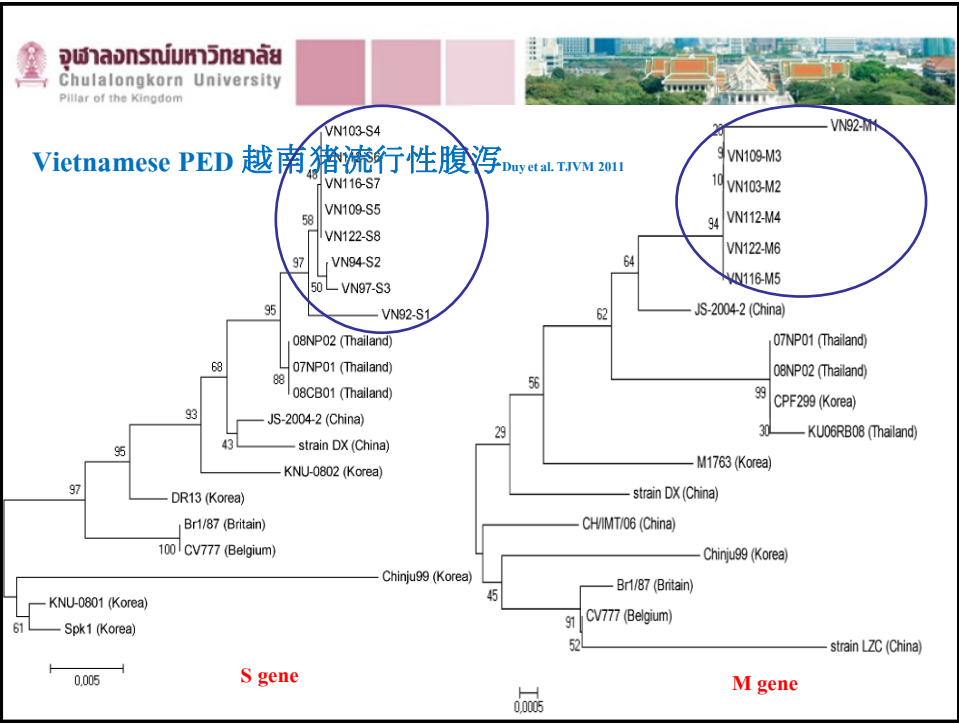
Since late 2007, several outbreaks of porcine epidemic diarrhea virus (PEDV) infection have emerged in Thailand. Phylogenetic analysis places all Thai PEDV isolates during the outbreaks in the same clade as the Chinese strain JS-2004-2. This new genotype PEDV is prevailing and currently causing sporadic outbreaks in Thailand.

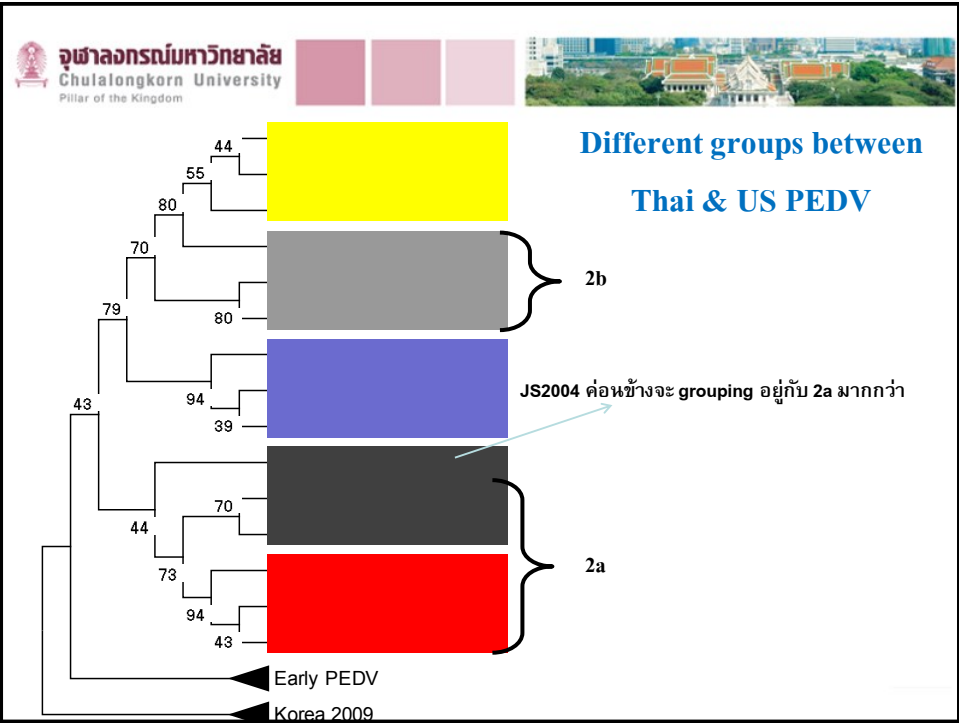
Emerging Infectious Diseases • [www.cdc.gov/eid](http://www.cdc.gov/eid) • Vol. 15, No. 7, July 2009



Figure 1 A. A suckling piglet with severe diarrhea and dehydration. 哺乳仔猪严重腹泻和脱水。  
 B. Severe catarrhal enteritis with congestion (Bar = 1 cm). 严重卡他性肠炎充血 (Bar=1厘米)。  
 C. Intestinal lacteals (arrows) grossly demonstrating normal absorption capacity of the intestinal villi in a normal piglet (Bar = 0.5 cm). 小肠乳糜管 (箭头) 肉眼展示一个正常的仔猪小肠绒毛正常的吸收能力 (Bar=0.5厘米)。  
 D. Disappearance of intestinal lacteals demonstrating malabsorption syndrome of the intestinal villi in the infected piglet (Bar = 0.5 cm). 肠道乳糜管的消失证明被感染的仔猪小肠绒毛吸收不良综合征 (Bar=0.5厘米)。  
 E. Marked shortening and blunting of the intestinal villi (Bar = 25 μm). F. Intestinal epithelial cells expressing PEDV antigen in the cytoplasm (arrow head): visible as brown staining (Bar = 25 μm). 标记的小肠绒毛缩短和钝化 (Bar=25微米)。F. 肠上皮细胞在细胞质中表达猪流行性腹泻病毒抗原 (箭头) : 可见棕色染色 (Bar=25微米)。 **EID, 2009**







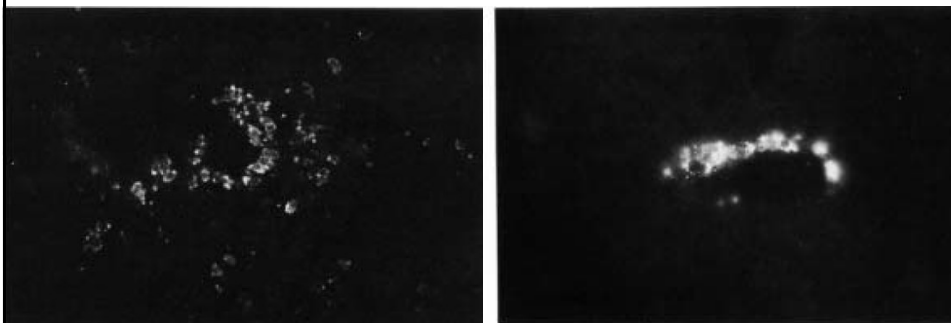




## La Piedad Michoacan Paramyxovirus (LPMV) or Porcine Paramyxovirus

- Demonstrated in tissues from the respiratory tract and central nervous system (CNS) tissues

Allan et al. 1996 JVDI



### African Swine Fever

- Asfivirus (DNA)
- Transmit by ticks
- No vaccine available
- No neutralizing Abs
- No immunotolerance

### Classical swine Fever

- Pestivirus (RNA)
- Not transmit by ticks
- Available vaccines
- NPLA
- Immunotolerance
- Button ulcer in chronic cases

Differential Dx: **HP-PRRS, Salmonellosis, Erysipelas, PDNS, Eperythrozoonosis & other septicaemic conditions**





## Take home messages?

- Suspicion of ASF  
Diagnosis confirmed (Differential Dx)
    - Quarantine
      - Entire herd
      - Strict enforcement
      - Authorities notified
  - Disposal of carcasses
    - Burial
    - Burning
- The sooner you found the disease,  
The better you can control successfully!!



## Bungowannah virus or Porcine myocarditis (PMC) syndrome

- June 2003 in New South Walse, Australia
- Pestivirus ≠ Classical swine fever
- Immunotolerance & persistant infection when infected pregnant sows.
- Multifocal nonsuppurative myocarditis
- Similar to CSF lesions



35 days gestation



NSW Primary Industries





## Possible involving Factors

- Cross border animal movement!
- **Biosecurity Failures**  
(Intra- & Inter-farm spreading)
- Changing farm & management systems
- Exposing to the wild animals
- Global warming
- **Globalization & the new coming AEC!!**

General  
Swine  
Disease  
and  
Foreign  
Animal  
Disease





## Acknowledgements 致谢

