

## ASF & other major swine diseases



ASF FAO meeting, BKK, September 2018



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Dr. Sandra Blome, CU Vet March 15, 2019

## Major Factors contributing to EID

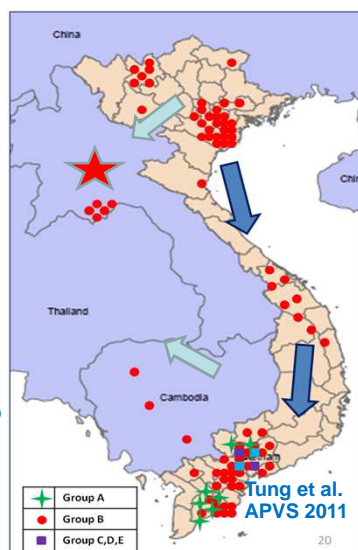
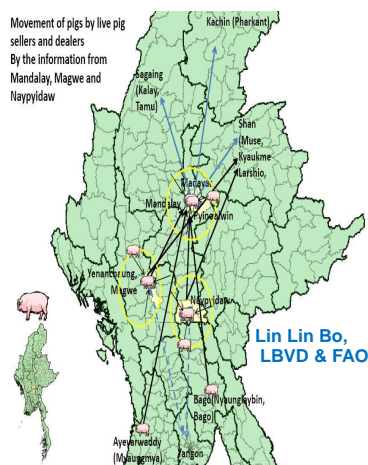
- **HUMAN BEHAVIOR**
  - Political, Social, Culture & **ECONOMIC**
- **PHYSICAL ENVIRONMENTAL FACTORS**
- **ECOLOGIC FACTORS**
  - Climatic changes & forestation
- **GENETIC/BIOLOGIC FACTORS**
  - Host and agent mutations & engineered viruses
  - Increased survival of susceptible hosts
  - Monoculture environment of the farm industry

## HP PRRSV Challenge experiment



HP-PRRSV gains access to a population of large sialoadhesin-negative epithelial and subepithelial monocytic cells producing sepsis by high viral load production.

## HP-PRRSV





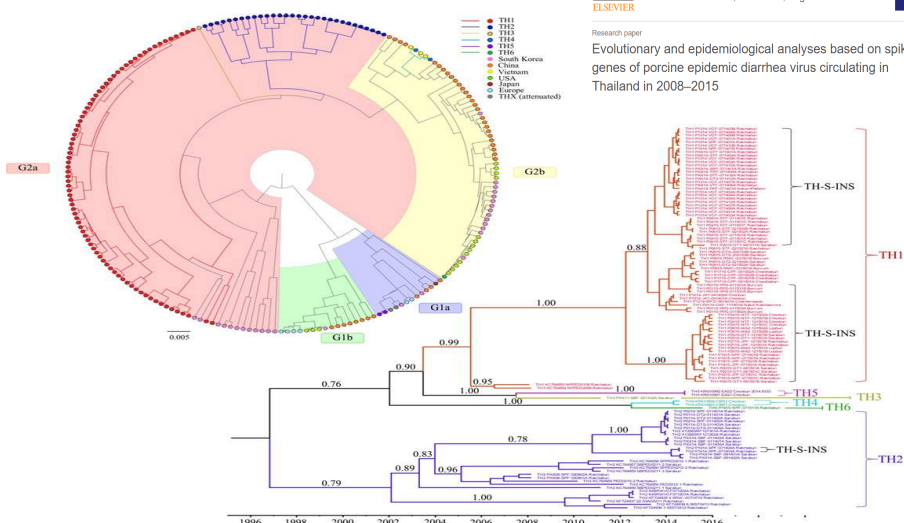
# Chinese-like Strain of Porcine Epidemic Diarrhea Virus, Thailand

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 15, No. 7, July 2009



Research paper

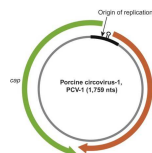
Evolutionary and epidemiological analyses based on spike genes of porcine epidemic diarrhea virus circulating in Thailand in 2008–2015



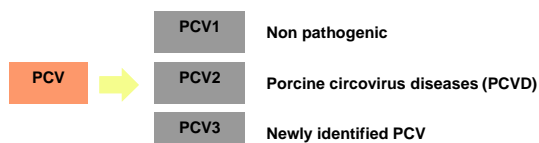
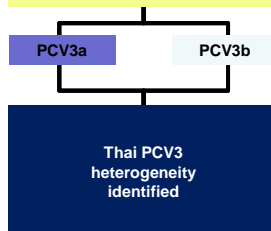


## Porcine circovirus (PCV)

- Non-envelope DNA virus
- Two major ORFs
  - ORF1: replication
  - ORF2: capsid

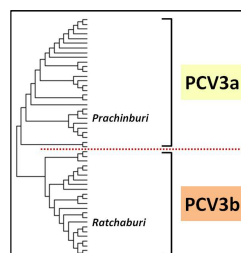


Two PCV3 genotypes  
(phylogenetic analysis)



Short communication

Porcine circovirus type 3 (PCV3) infection in grower pigs from a Thai farm suffering from porcine respiratory disease complex (PRDC)



# The first detection of Senecavirus A in pigs in Thailand, 2016

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## Summary

We report the first detection of Senecavirus A (SVA) in nine of 12 (75%) pigs in Thailand in 2016. The full-length genome demonstrated that Thai SVA isolates were closely related to the first Canada strain (11-55910-3) than the recent strains causing outbreaks in Brazil, the United States and China in 2015–2016.

## KEYWORDS

pigs, Senecavirus A, Thailand

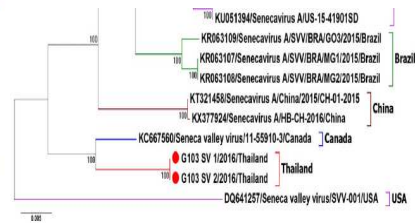
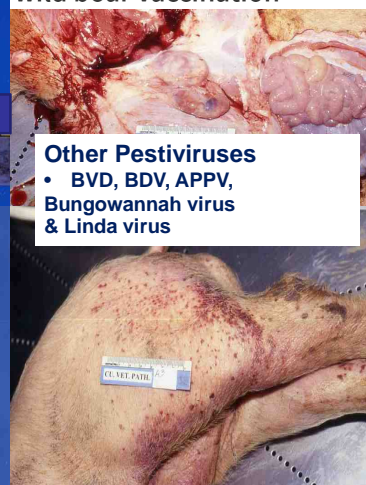


Figure 1: Ruptured nasal vesicle



Figure 2: Ulcerative lesion on coronary band  
Rademacher et al., Iowa State University  
| Aug 01, 2016

## CSF Japan: Over 75,000 pigs culled; wild boar vaccination



**Other Pestiviruses**  
• BVD, BDV, APPV,  
Bungowannah virus  
& Linda virus



## ASF in Sardinia - ... since 1978

FRANCESCO LUTTERI (UNIV. FLI)  
Fondazione Internazionale di Epidemiologia  
Fondazione Italiana per lo Studio delle  
Malattie Infettive

Cr. S. Blome

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Malattie Infettive



DOI: 10.1111/tbed.12740

ORIGINAL ARTICLE

## Biosecurity Issues!!

WILEY

### Why is African swine fever still present in Sardinia?

C. Jurado<sup>1</sup> | E. Fernández-Carrión<sup>1</sup> | L. Mur<sup>2</sup> | S. Rolesu<sup>3</sup> | A. Laddomada<sup>3</sup> | J. M. Sánchez-Vizcaíno<sup>1</sup>

- Reduce potential contact with wild boar and free-ranging pigs.
- Reduce number of family farms, raise biosecurity levels on remaining farms, improve farming practices as well as increase knowledge, concern and awareness among pig owners.
- Implement protocols applied during slaughters for self-consumption.
- Implement measures to increase biosecurity during animal movements.
- Implement efforts to identify and penalize farms that do not perform annual censuses.

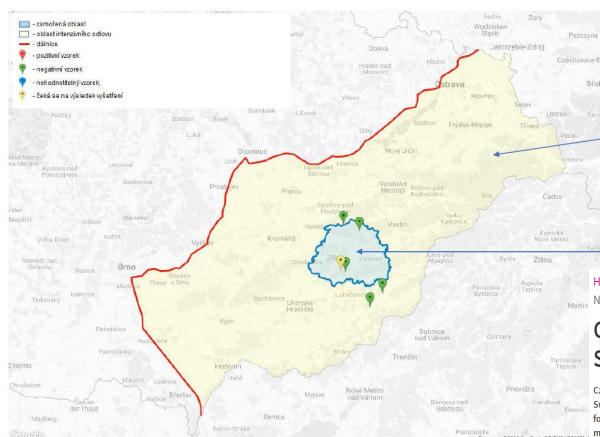
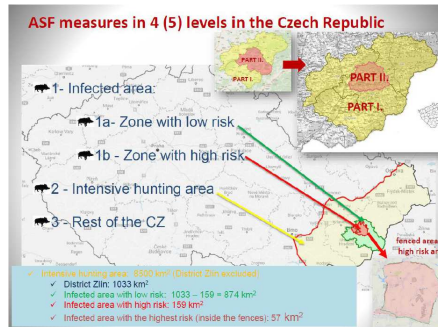


## Current situation in Eastern European countries

- Wild boar is the most severely affected host (scavenging behaviors).
- Multiple viral introductions through movements of infected free-ranging wild boar.
- Combination of pig farms located in areas suitable for wild boar as well as the existence of low biosecurity measures.

**A human driven-disease**

### Czech Republic



Dead wild boars since 1.1.2019

Intensive wild boars hunting zone

Infected zone

Health  
News | Feb 28, 2019

### Czechia officially free from African Swine Fever

Czechia is the 1st country in the EU to be officially declared free from African Swine Fever (ASF) after it was infected in recent years. As no outbreak has been found in Czechia since April 2019, the country received the support of the EU member states to lift all restrictions in the country.





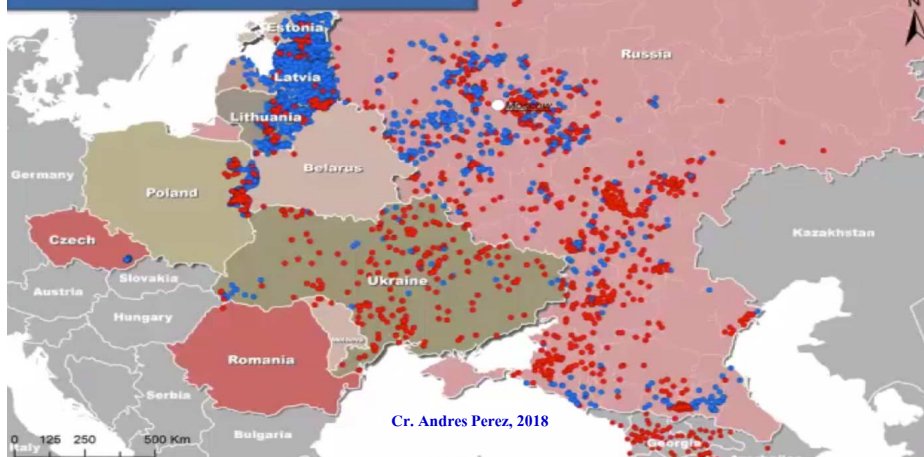


2017 as of September, 13th

- Two new countries affected: Czech Republic and Romania
- Rise of incidence in domestic pigs

Legend:

ASF outbreaks  
• in wild boars  
• in domestic pigs

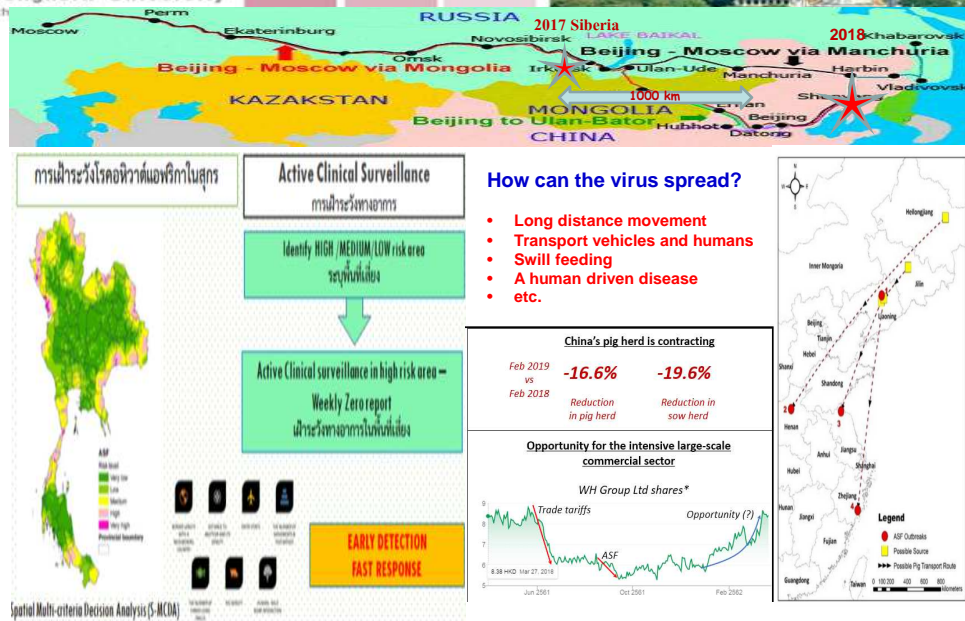


Cr. Andres Perez, 2018



## ASF Outbreaks in Asia





## ASF: main transmission pathways

Results of study in Russia for the period of ASF spread 2007 – 2012:

Source of infection	Number	Percent
Trade of infected pigs	1	0.3 %
Direct contact between neighboring farms (backyards)	5	1.7 %
Contaminated food waste brought by farm personnel	1	0.3 %
Contaminated vehicles	108	38.0 %
Contact with wild boars	4	1.4 %
Feeding contaminated fodders	100	35.0 %
Not defined	65	23.0 %

Adopted from: Belyanin, 2013.  
PhD Thesis 'Dynamics of spread and monitoring of the ASF epidemic process'

**TABLE 3** *Resilience of ASFV in various environmental conditions*

Item	ASFV survival time
Meat with and without bone and ground meat	105 days
Salted meat	182 days
Cooked meat (minimum of 30 minutes at 70 °C)	0
Dried meat	300 days
Smoked and deboned meat	30 days
Frozen meat	1 000 days
Chilled meat	110 days
Offal	105 days
Skin/Fat (also dried)	300 days
Blood stored at 4 °C	18 months
Faeces at room temperature	11 days
Putrefied blood	15 weeks
Contaminated pig pens	1 month

Source: Beltran-Alcrudo et al., 2017

Infective doses depend on the route of infection

## Survival of viral pathogens in animal feed ingredients under transboundary shipping models

Ingredient	SVA (FMDV)	ASFV	PSV (SVDV)	PEDV	FCV (VESV)	PCV2	BHV-1 (PRV)
Soybean meal-Conventional	(+)	(+)	(+)	(+)	(+)	(-)	(+)
Soybean meal-Organic	(-)	(+)	(+)	(+)	(-)	(-)	(-)
Soy oil cake	(+)	(+)	(+)	NT	(-)	(-)	(+)
DDGS	(+)	(-)	(-)	NT	(-)	(-)	(-)
Lysine	(+)	(-)	(+)	(+)	(+)	(+)	(-)
Choline	(+)	(+)	(-)	(+)	(-)	(+)	(-)
Vitamin D	(+)	(-)	(+)	(+)	(-)	(+)	(-)
Moist cat food	(+)	(+)	(+)	NT	(-)	(-)	(-)
Moist dog food	(+)	(+)	(+)	NT	(-)	(-)	(-)
Dry dog food	(+)	(+)	(+)	NT	(-)	(-)	(-)
Pork sausage casings	(+)	(+)	(+)	NT	(+)	(-)	(-)
Complete feed (+ control)	(+)	(+)	(+)	NT	(+)	(+)	(-)
Complete feed (- control)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Stock virus control	(-)	(+)	(-)	(-)	(-)	(-)	(-)

Fig 4. Virus viability in feed ingredient from Batch 4 samples, inclusive of previous PEDV results [14].

A red-colored box with a (+) indicates that virus was recovered in a viable form from a specific ingredient, while a green-colored box with a (-) indicates that viable virus was not recovered by VI and/or swine bioassay. Finally, a blue-colored box with NT denotes that these ingredients were not used in this study and therefore, no results are available.

doi:10.1371/journal.pone.0194509.g004



## What have we learned from China? (Positive Samples)

- Dried porcine plasma
- Pellet feed & Swill feeding
- Meat products in the feed mill kitchen
- Raw materials (Corn, Soybean meal, wheat etc.)
- Employee cloths, boots etc.
- Truck surface & tires of the feed mill
- Road outside of the pig farms
- Ground surface of the feed mill & slaughter houses
- Outside of disinfectant boxes

Cr. Jason Yan

Chulalongkorn University



## Chronological spreading of ASF in the Farm

Cr. Nadezhda Kononova

01/09/2016 new dead pigs at room 7/1, 7/2, 5/1, 3/1

- August 22, 2016
- August 29, 2016
- August 30, 2016
- September 1, 2016

Once you found the disease,  
You can't keep them All!



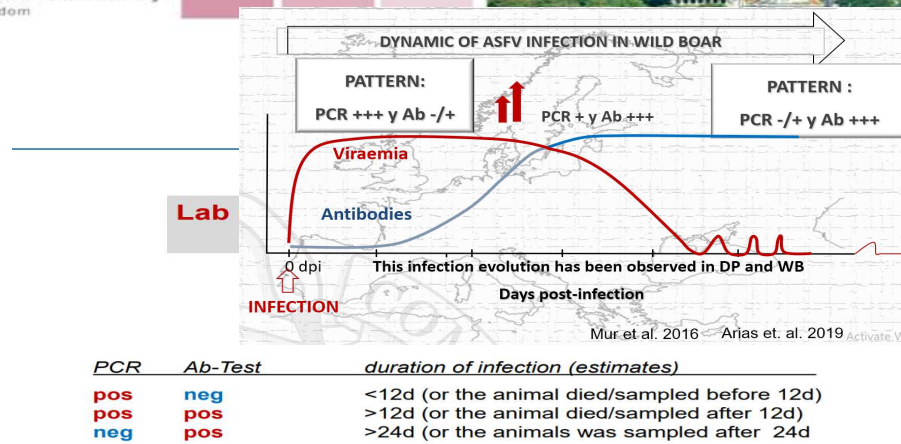
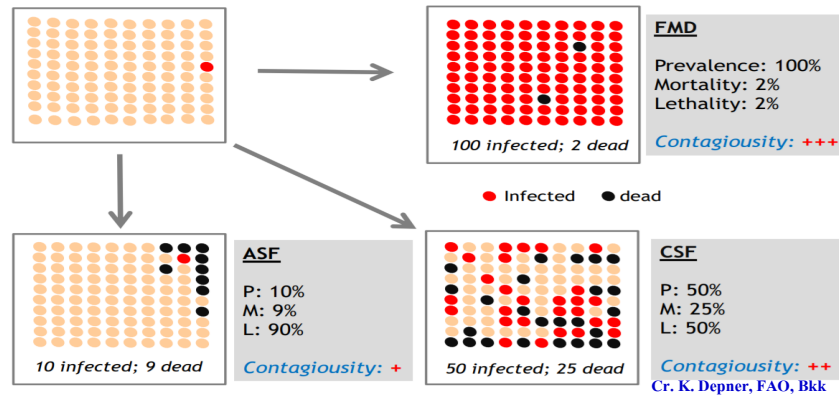
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## ASF - CSF - FMD

FRIEDRICH-LOETZL-INSTITUT  
FLI  
Bundesforschungsinstitut für Tiergesundheit  
Federal Research Institute for Animal Health



Cr. K. Depner, FAO, Bkk



## Proposed sampling strategy for outbreak investigation

- Suspected farms
  - Collect tissue samples from 5 **dead pigs**
  - Inguinal lymph node
  - If dead pigs < 5, collect blood from **sick pigs**
- Neighbor farms
  - Collect blood samples from 5 **sick pigs**
  - Serum or plasma
  - If sick pigs < 5, no need to collect 5 samples



FAO

Place	Types	No. samples
Suspected farms	Dead / sick pigs	5
Neighbor farms (n=5)	Blood from sick pigs (n=5)	25
<b>Total</b>		<b>30</b>

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TABLE 3

Main clinical signs and postmortem findings observed in the different forms of ASF

	Peracute ASF	Acute ASF	Subacute ASF	Chronic ASF
<b>Fever</b>	High	High	Moderate	Irregular or absent
<b>Thrombocytopenia</b>	Absent	Absent or slight (late)	Transient	Absent
<b>Skin</b>	Erythema	Erythema	Erythema	Necrotic areas
<b>Lymph nodes</b>	-	Gastrohepatic and renal with marbled aspect	The majority of lymph nodes resemble a blood clot	Swollen
<b>Spleen</b>	-	Hyperaemic splenomegaly	Partial hyperaemic splenomegaly or focal infarction	Enlarged with normal colour
<b>Kidney</b>	-	Petechial haemorrhages, mainly in cortex	Petechial haemorrhages in cortex, medulla and pelvis; peri-renal oedema	-
<b>Lung</b>	-	Severe alveolar oedema	-	Pleuritis and pneumonia
<b>Gall bladder</b>	-	Petechial haemorrhages	Wall oedema	-
<b>Heart</b>	-	Haemorrhages in epicardium and endocardium	Haemorrhages in epicardium and endocardium; hydropericardium	Fibrinous pericarditis
<b>Tonsils</b>	-	-	-	Necrotic foci
<b>Reproductive alteration</b>	-	-	Abortion	Abortion

Source: Extracted from Sanchez-Vizcaino et al., 2015

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## African Swine fever



A pig that is affected by ASF - one of the characteristics is the occurrence of petechias. Photo credit: Lina Mur.



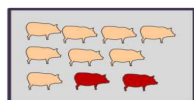
## ASF control and eradication

FLI  
Federal Research Institute for Animal Health

### Key characteristics of ASF:

- low contagiousity, slow spread, few secondary infections
- no transmission by wind or insects,
- **site fidelity** (stable disease / habitat disease),

### DP: stable disease



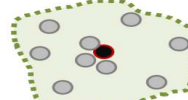
#### Measures:

1. Standstill
2. Culling
3. C&D

**Successful approach!!**

Cleaning & Disinfection

### WB: habitat disease



#### Measures:

1. Standstill (no disturbance of WB, no hunting, electrical fence, (feeding)
2. (Trapping)
3. Disposal of carcasses

**"Virtual stable" in forest**

Cr. K. Depner, FAO, Bkk



## ASF 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!!**



### Why **NO** vaccine for ASFV?

Large complex virus with many proteins (60-185 encoded)  
Inactivated / passaged virus does not protect  
Vaccine candidate antigens (viral proteins) do not protect  
Vaccine trials require high containment facilities - expensive  
Largely African problem (in past) - lack of commercial market.  
Few groups involved in research – USA example

Cr. Chris Oura, 2018

**The  
bottom  
line**

More  
research  
is needed!

ON MAY 10, 2019

Possible ASF vaccine tested on wild boars  
in Spain

Vaccine created using serum from wild boar that tested positive for ASF

**China to Start ASF Vaccine Clinical Trials,  
Experts Share Caution**

**Scientists Say Don't Get Too Excited!**

Jennifer Shike  
May 24, 2019 12:35 PM

