Essentials and basics of ASF

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18 February 2019
Belgrade

How much do we need to know about ASF to be able to prevent, control and eradicate?

- Something about the virus
- Something about the clinical course
- Something about diagnosis
- Something about contagiosity, infectiosity, transmission…

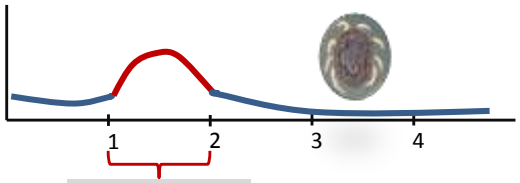
- Much about epidemiology

- **Very much about human - host interactions**
- **Very much about human behaviour**

ASF is a human driven disease
("anthropogenic factors")

Sylvatic cycle: warthog/bushpig - soft ticks

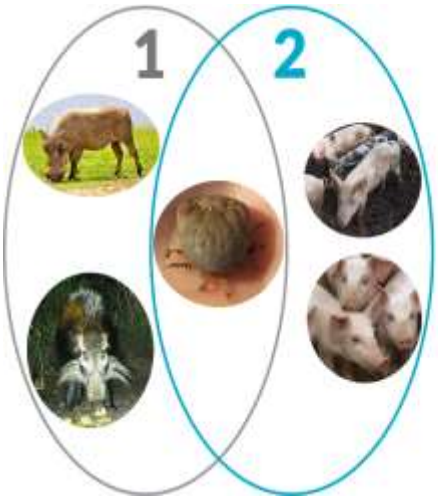
No clinic



Infectious period

Chenais et al., 201

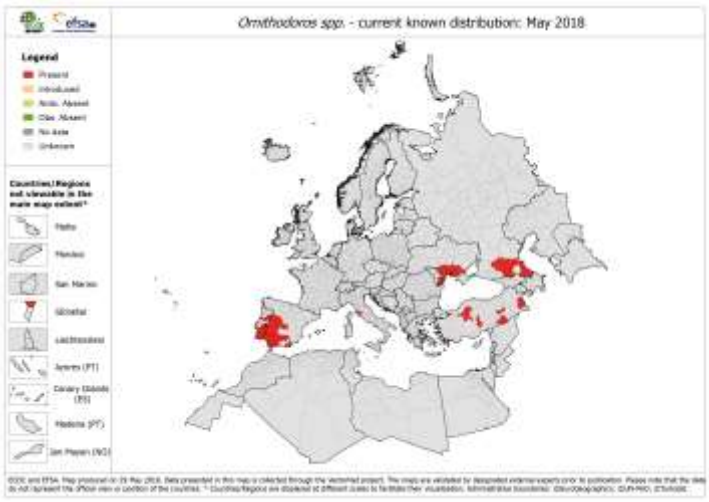
Tick-pig cycle: soft ticks - domestic pigs.



CLINIC!!!

Chenais et al., 2018

Ornithodorus as competent vector



AFRICA
O. Moubata
O. Savignyi
O. Porcinus

EUROPE:
O. Erraticus
(Vector competenc
is lower)

https://ecdc.europa.eu/en/disease-vectors/surveillance-and-disease-data/tick-maps

Domestic cycle: domestic pigs - pig products

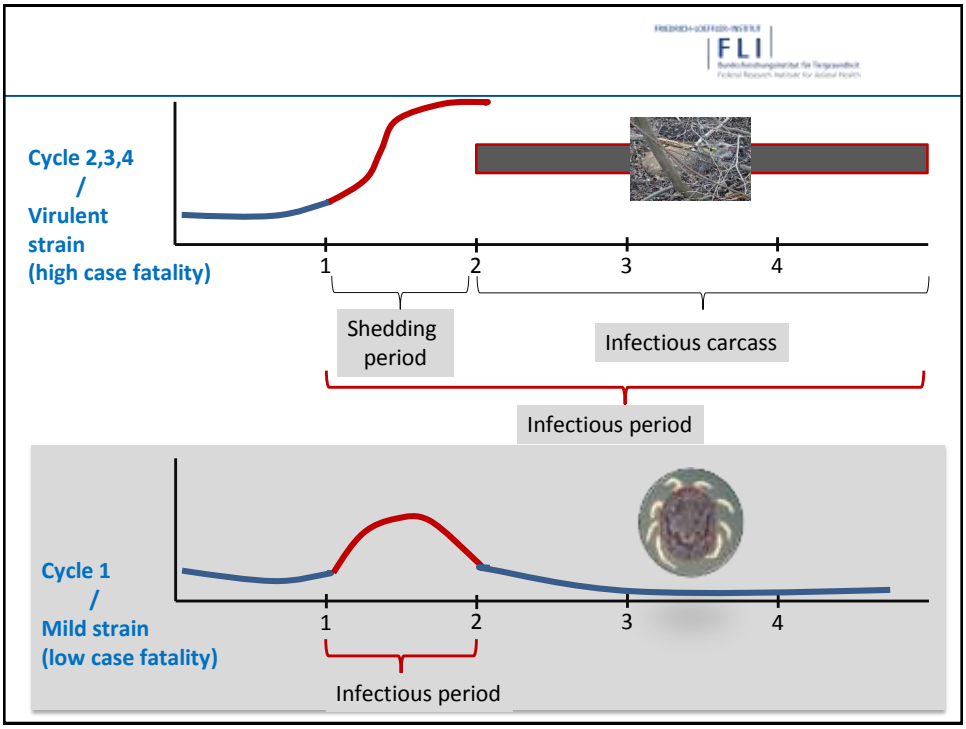
Oral infection!!!

Chenais et al., 2018

Wild boar-habitat cycle

Chenais et al., 2018

1) Sylvatic cycle: the common warthogs; bushpigs and soft ticks.
2) Tick-pig cycle: soft ticks; domestic pigs.
3) Domestic cycle: domestic pigs and pig products.
4) Wild boar-habitat cycle: wild boar; pig- and wild boar products and carcasses; the habitat.



ASF virus is relatively stable

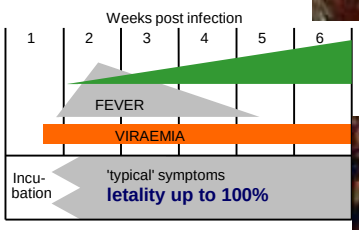
- frozen meat: indefinitely
- dry meat and fat: almost one year
- blood, salted meat and offal: more than 3 months
- faeces: over one week

Temperature plays an important role in decreasing the survival duration of ASF virus in any matrix.

ASFV survives the process of putrefaction and carcasses may remain infectious for weeks

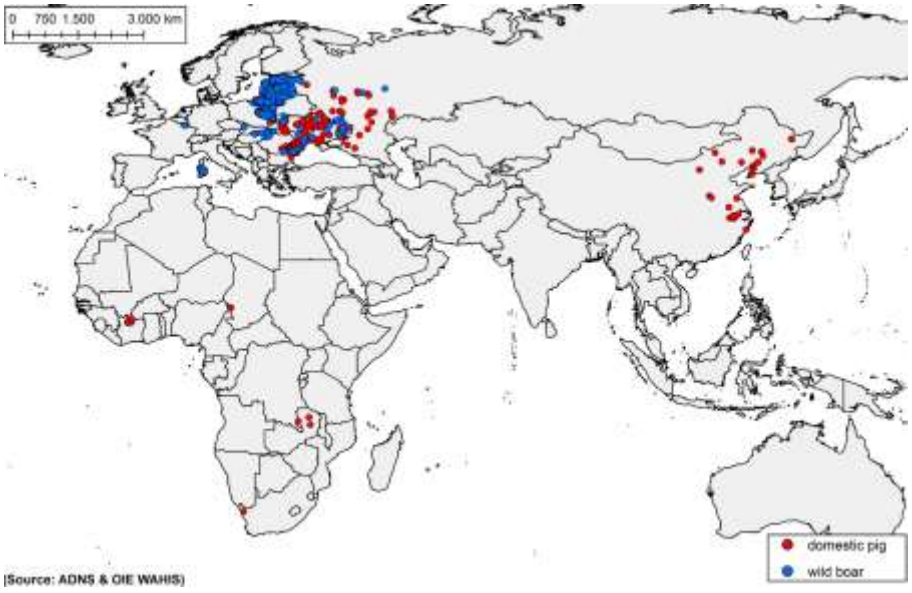
A bit about ASF

- ✓ Scientific information available
- ✓ Knowledge about ways & routes of transmission
- ✓ Diagnostic tools available



If we do not manage ASF, it's not because of lack of knowledge…

ASF 2018


0 750 1.500 3.000 km
domestic pig
wild boar
(Source: ADNS & OIE WAHIS)


FLI

ASF: Working hypotheses for wild boar

1) ASF will fade out rapidly from the affected wild boar population … e ASFV *(IMP*

2) ASF will … westwards … an infecte… population naïve neig… within a short period of time initiating an epidemic wave… *(EXPLOSION)*

years later…….

both hypotheses proved to be wrong !!!

- NO implosion
- NO explosion

=> Endemic in the region, slow spread

Textbooks are misleading…

copy/paste …

"ASF is a highly contagious disease… causing high mortality up to 100%…"

- *Mortality: Dead animals / epidemiological unit*
- *Case fatality (lethality): Dead animals / infected animals*

Contagiousity/Contagiousness

percentage of animals which get infected after contact with an infectious agent.

probability that an animal picks up an infection after contact with a pathogen

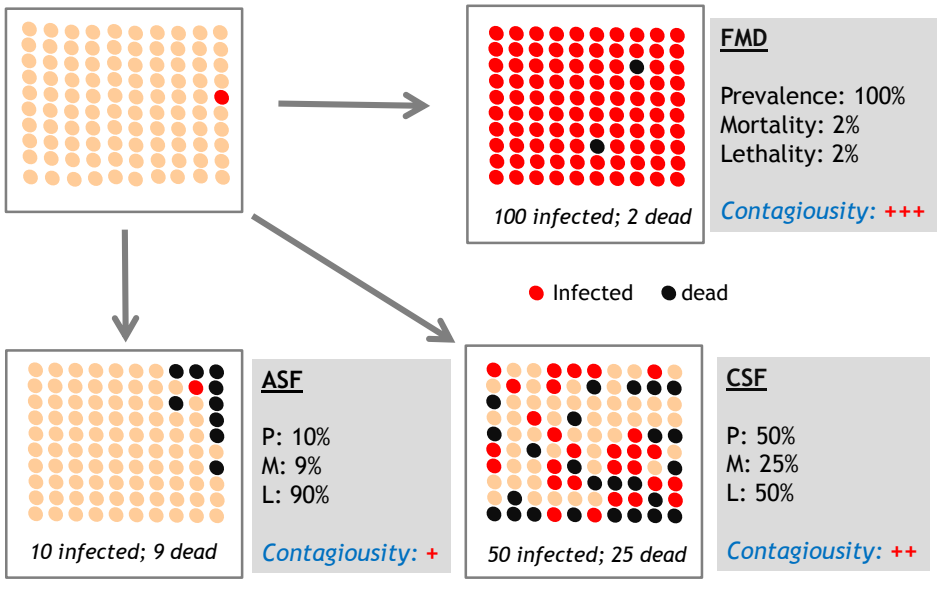
It is NOT an indicator for disease severity and impact!!!

- *Low contagious diseases with severe course and high impact*
- *Highly contagious diseases with mild course and low impact*

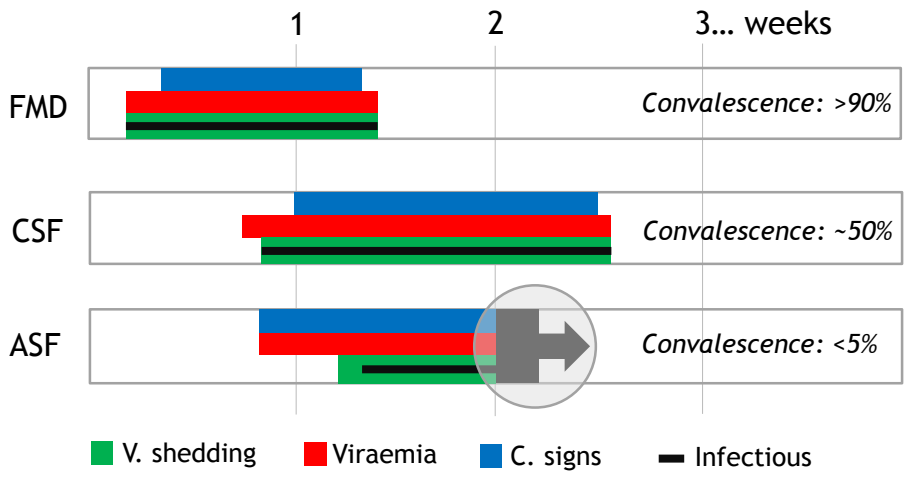
Contagiousness
Probability of infection

Low	Medium	High
< 30%	~ 50%	> 60%

ASF - CSF - FMD



ASF - CSF - FMD



Probability of infection

within a group (within stable)
high virus dose (>1000 HAU)
parenteral transmission

HIGH

Contagiousity

LOW

between groups (open system…e.g. forest)
low virus dose (<100 HAU)
oral transmission

Virus dose & contagiousity

Inoculated	Dose	Infected	Index
12 x ASPV Armenia	25 HAU	1	0,08 (1)
12 x ASPV Armenia	3 HAU	1	0,08 (1)
6 x ASPV Armenia	1000 HAU	0	0 (0)
30 x ASPV NL 1986	20.000 HAU	20	0,66 (1)
10 x ASPV Estland	100.000 HAU	9	0,9 (1)
5 x ASPV Estland	100.000 HAU	4	0,8 (1)

(Beer and Blome, FLI-IVD)

8% - 90%

Foto: M. Masulis
Vet. Sevice Lithuani

Characteristics of epidemics in wildlife populations *(and backyards???)*

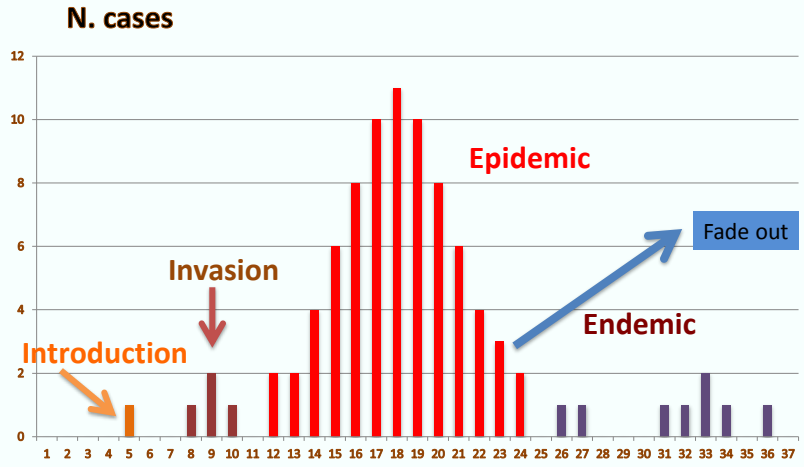
Complex situation: interaction of many factors
(infected animals, animal density, hunting activities, agriculture, etc.)

Obscure situation: not all important parameters are known *(e.g. animal density, animal movements, etc…)*

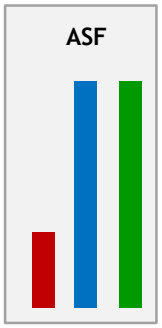
Dynamic situation: *permanent change of parameters*
(e.g. seasonal influences, fluctuation in animal number)

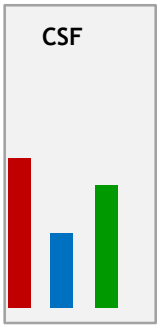
Influencing one factor can cause unpredicted side-effects

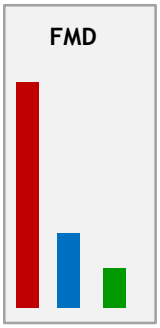
The 4 phases of a transmissible disease



Summary







Conatgiousity
Tenacity
Case fatality

Endemic situation, slow spread, does not fade out

Fades out after reducing susceptibles by vaccination

Fades out spontaneously

Two of three parameters should be low/medium for the epidemic to fade out

Persistency triangle (ASF)

High tenacity ensures long term virus persistence in the environment

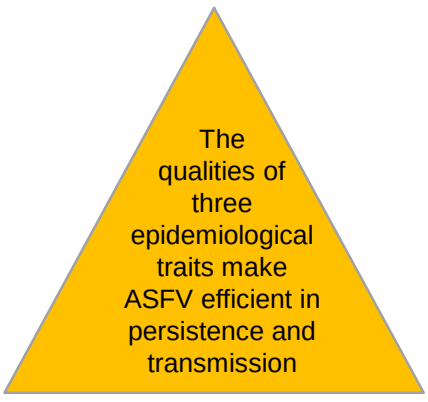
High case fatality rate makes the virus largely available in the form of many carcasses.,

The relatively **low contagiousity** prevents the complete depletion of the host population and may hamper early detection.

The interaction of these three parameters maximize local persistence and limits fast geographical spread of the virus within an affected population. ASF is maintained locally, with a low but steady presence, making its eradication a challenge.

Chenais et al. 2019

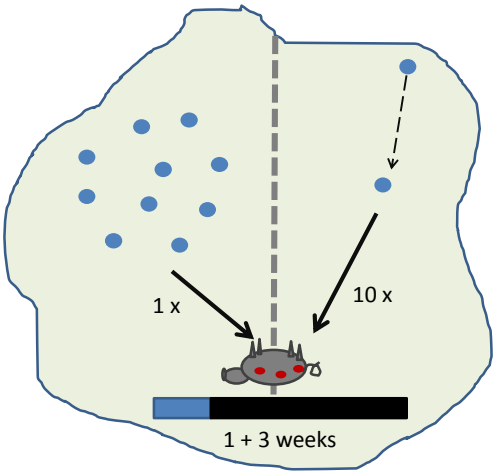
Low contagiousity



High case fatality

High tenacity & long exposer

Exposure opportunity



?

Carcass removal

- If carcasses will be removed, exposure opportunity will decrease -> less contacts
- If carcasses will NOT be removed, exposure opportunity will increase -> more contacts

Passive surveillance for DP and WB

5/95 surveillance concept is not purposeful

Active surveillance gives a false sense of security

Early detection of ASF in wild boar

Passive surveillance vs. active surveillance

	tested	positive	% positive
Passive (found dead)	245	177	***72.24***
Active (hunted)	2765	40	***1.45***
		217	

Passive / Active: 72.24 / 1.45 = 49,82

*The probability to detect an ASF positive case is **50** times higher in dead animals than in hunted animals*

***81 out of 100** positive cases are likely to be detected in **dead** wild boar*
(177 / 217 x 100 = 81)

FLI

Biosecurity

the most effective control tool

The only potent tool we have...

- *Africa - double fencing*
- *Three golden rules of biosecurity*

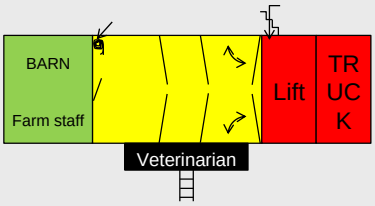
Biosecurity

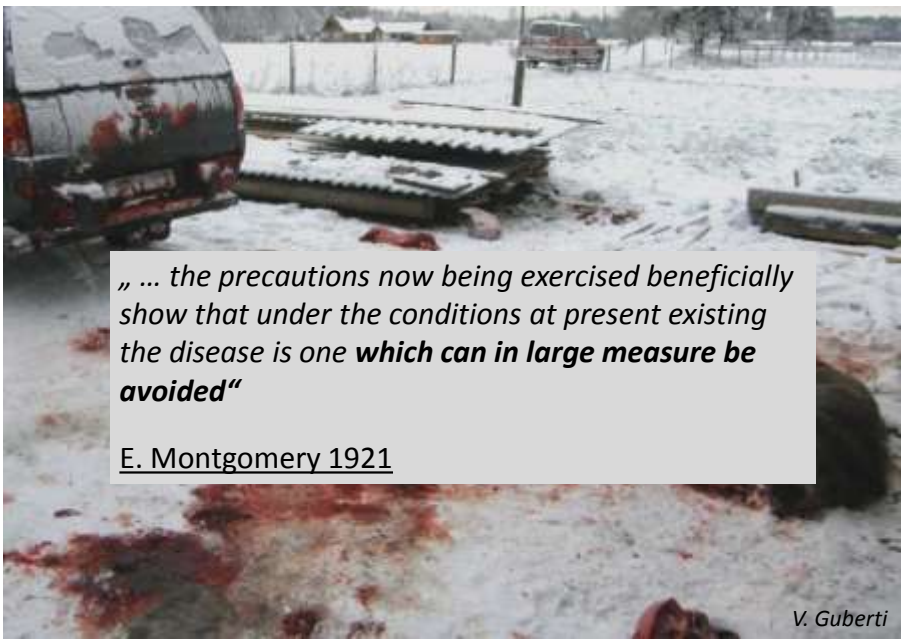
Hardware

J. Westergaard

Software

(Mindset/Philosophy)





„ … the precautions now being exercised beneficially show that under the conditions at present existing the disease is one ***which can in large measure be avoided“***

E. Montgomery 1921

V. Guberti

Biosecurity during hunting!!!

Good news (domestic pigs): no (rapid) spread of the disease

ASF in domestic pigs can be controlled effectively by good biosecurity!!!

Bad news (wild boar): no (rapid) spread of the disease

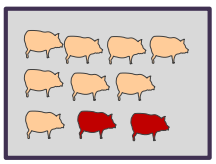
ASF in wild boar survives locally over months or years in wild boar populations (a habitat disease)

ASF control and eradication

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

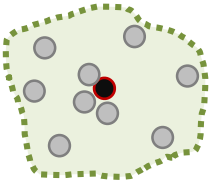


Measures:

1. Standstill
2. Culling
3. C&D

Successful approach!!

WB: habitat disease



Measures:

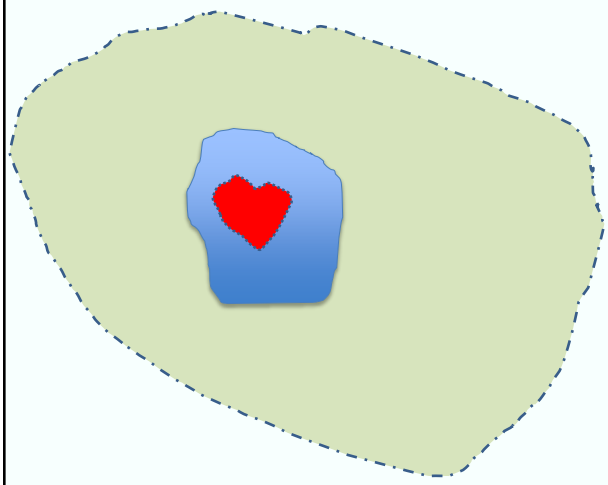
1. Standstill (no disturbance of WB, no hunting, electrical fence, (feeding)
2. (Trapping)
3. Disposal of carcasses

"Virtual stable" in forest

Freedom of disease	Presence of disease
Wild boar management measures	**Disease control measures**
e.g. population reduction to avoid agricultural damage	*not wild boar management measures!!!*
e.g. Intensive hunting	Movement restriction Ban of feeding Prohibition of hunting Intensive hunting

Hunting/Slaughtering ⟷ **Culling**

Measures based on ASF biology



CA: defind by carcasses found within 1-2 months
BA: defind by home range, ~ 6 km
IA: "legal area" >200km^2 400 - 1000 WB

Slow disease => be very patient in CA + BA!!!
Avoid any activity which disturb WB

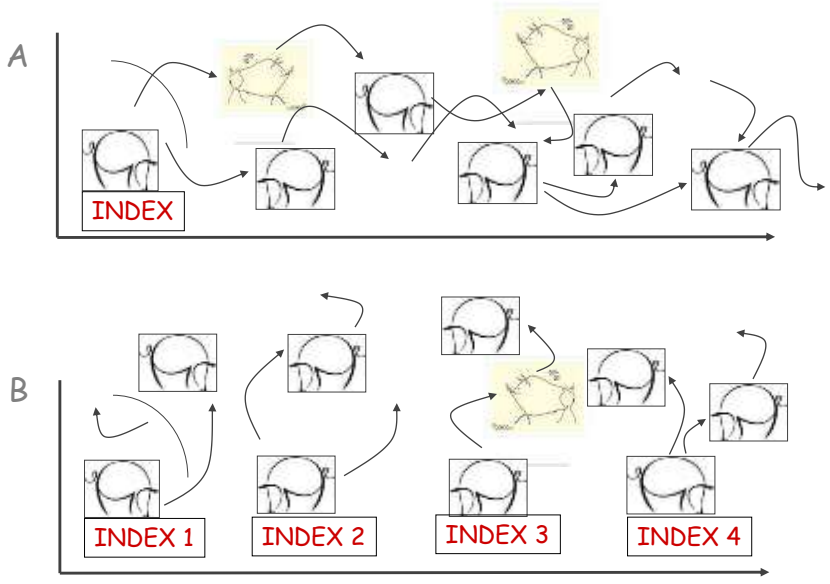
Lessons learned in recent years

- **ASF is in the field not a highly contagious disease**
- **ASF in WB is a habitat disease**
- **ASF is a "slow" disease**
  - ASF did not fade out: NO implosion
  - ASF did not spread rapidly (Rabies-like…) NO explosion
  - Lethality high (>90%)
  - Starting mortality low (<5%)
  - Prevalence low (<5%)
  - Not necessarily a density dependent process

Endemic in the region, slow spread

It changed the understanding of ASF

…identify the essentials,
spot the disease characteristics important for epidemiological understanding…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