

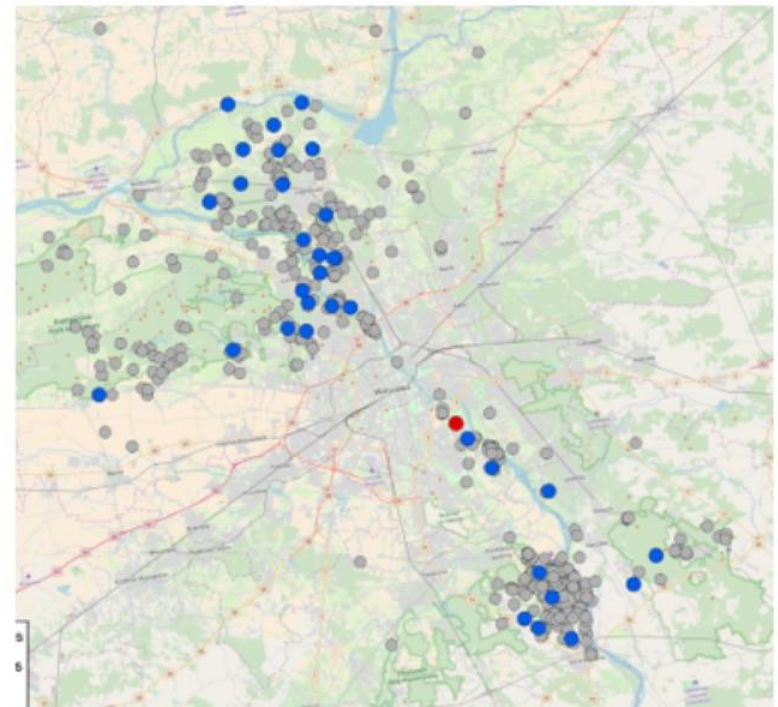
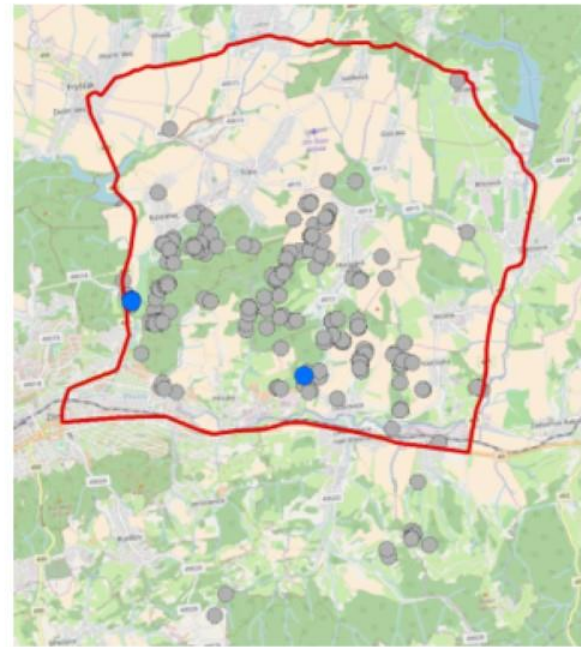
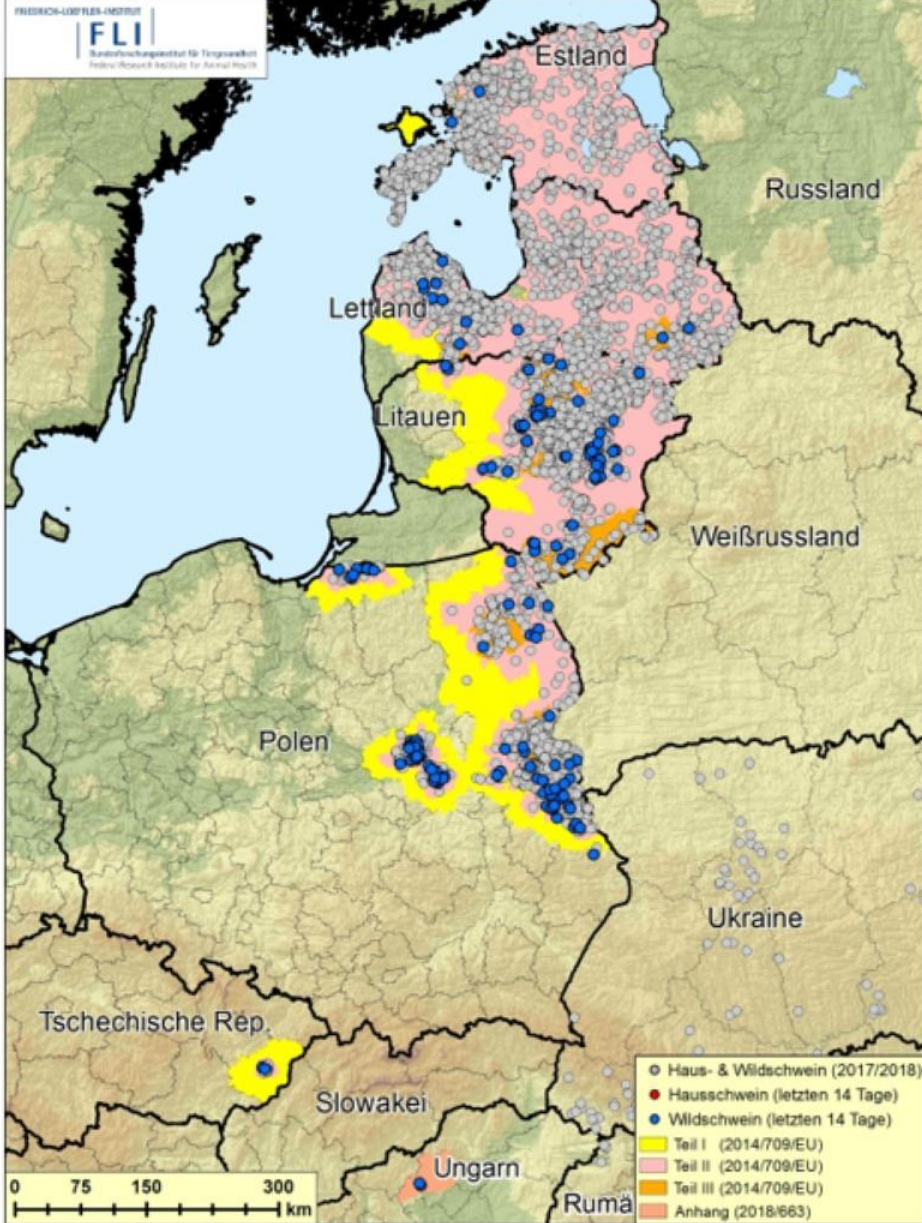
Is ASF a human driven disease?

K Depner
10 May 2018
Barcelona





Afrikanische Schweinepest im Baltikum, Polen, Tschechien, Ungarn, Rumänien und Ukraine Datenquelle: ADNS (Stand: 02.05.2018 - 09:50 Uhr) nach Feststellungsdatum; Restriktionsgebiete nach Anhang der Durchführungsbeschlüsse 2014/709/EU und 2018/663



4 epidemiologic cycles of ASF



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.

Characteristics of epidemics in wildlife populations

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...*)

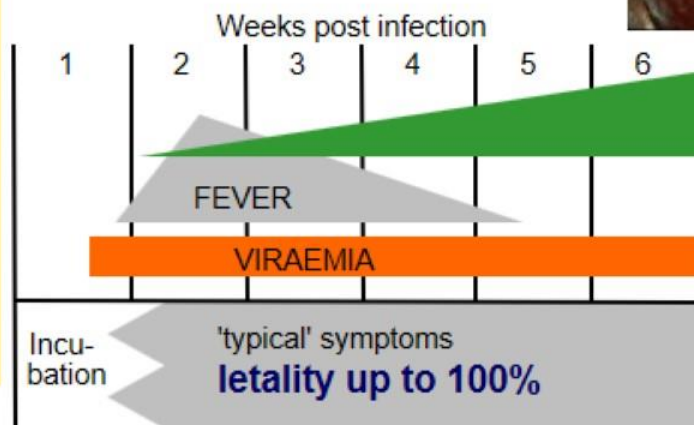
Dynamic situation: *permanent change of parameters*
(*e.g. seasonal influences, fluctuation in animal number*)

Influencing one factor can cause unpredicted side-effects

A bit about ASF

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

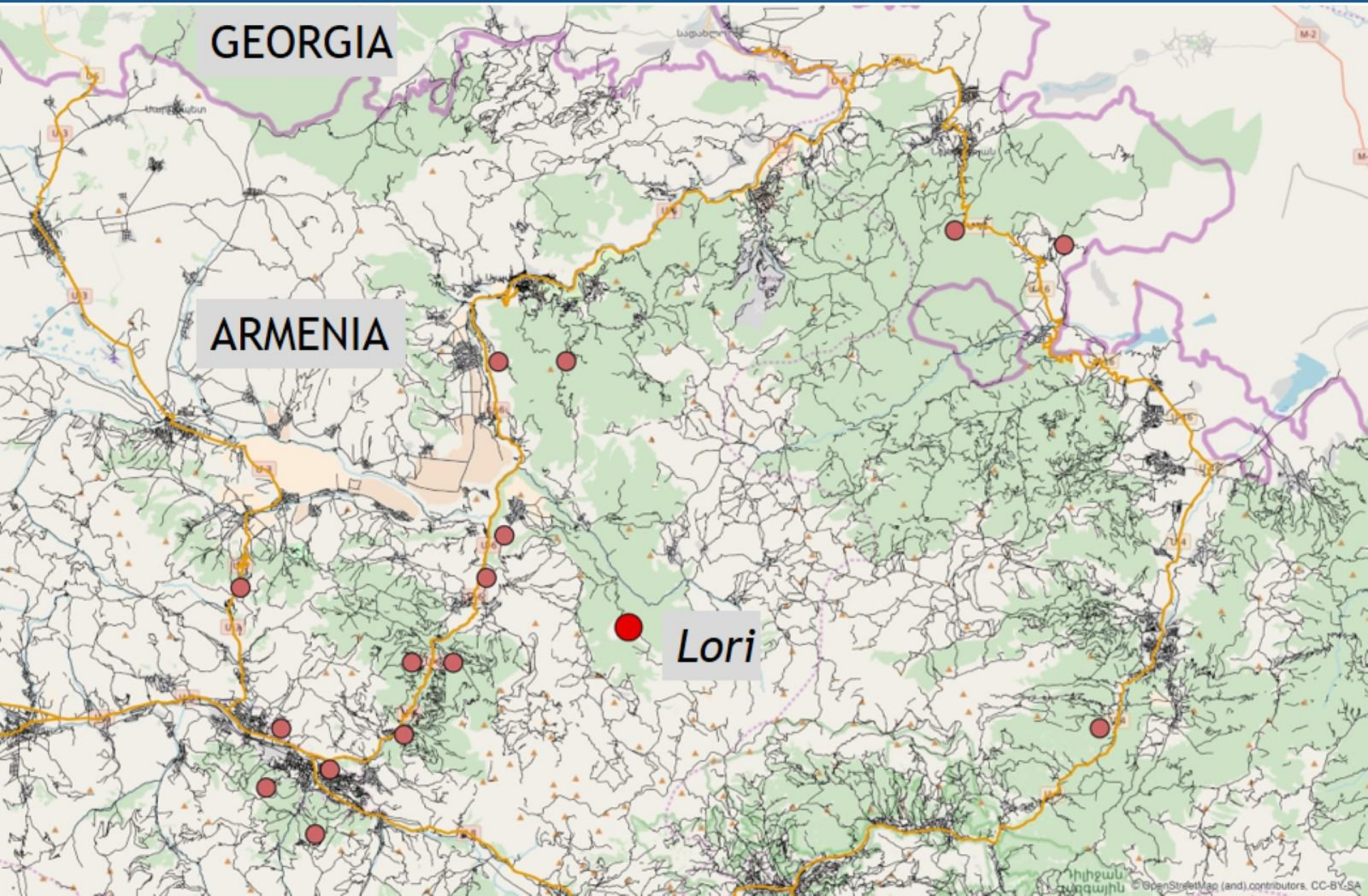
Acute course of ASF



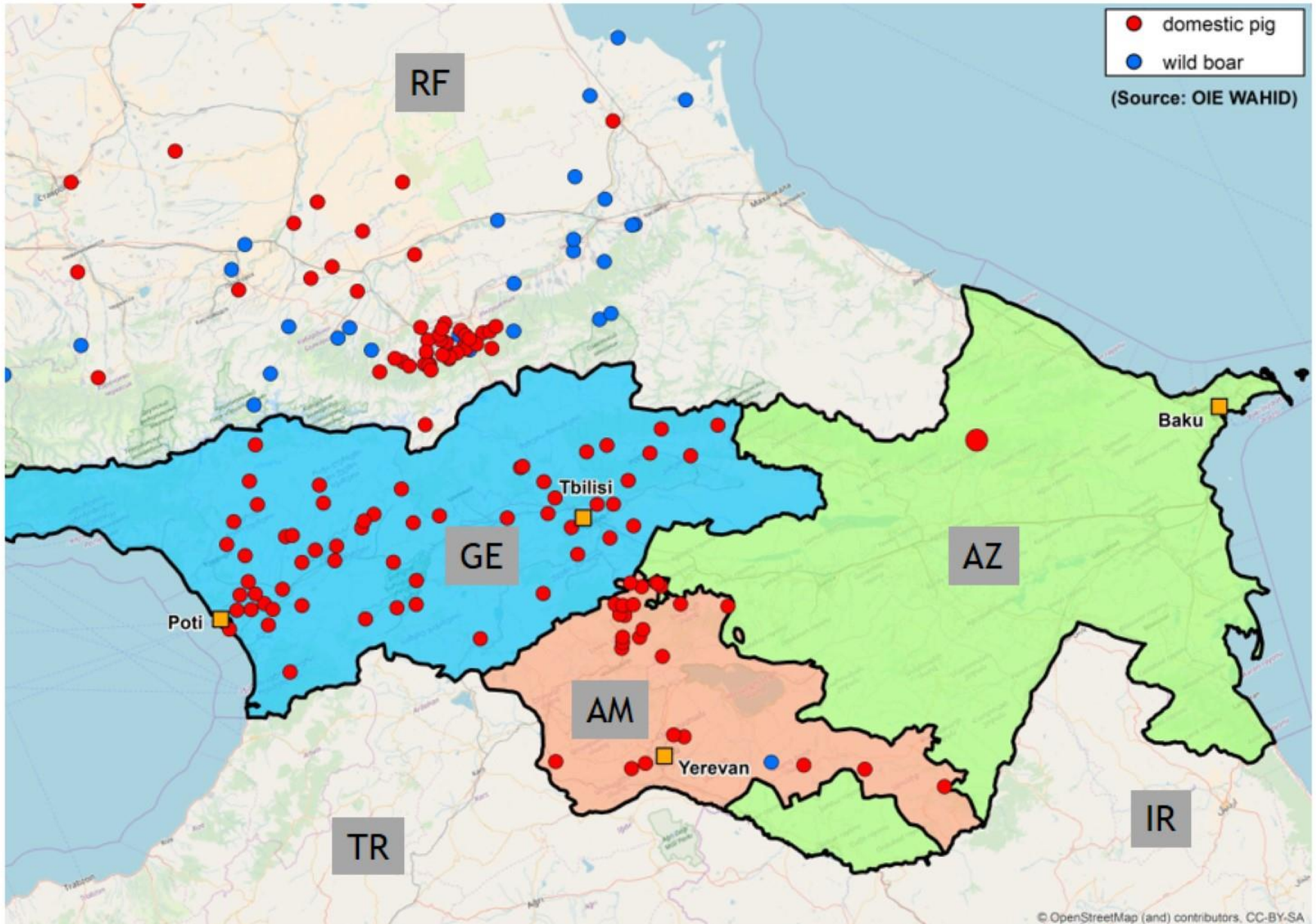
If we do not manage ASF, it's not because of lack of knowledge...

ASF is a human driven disease
(*“anthropogenic factors”*)

Along the roads...



ASF in Azerbaijan, January 2008



Textbooks are misleading...

copy/paste ...

“ASF is a highly contagious disease... causing high mortality up to 100%...”

Lessons learned in recent years

- ASF is not a highly contagious disease
- ASF in DP = stable disease
- ASF in WB = habitat disease

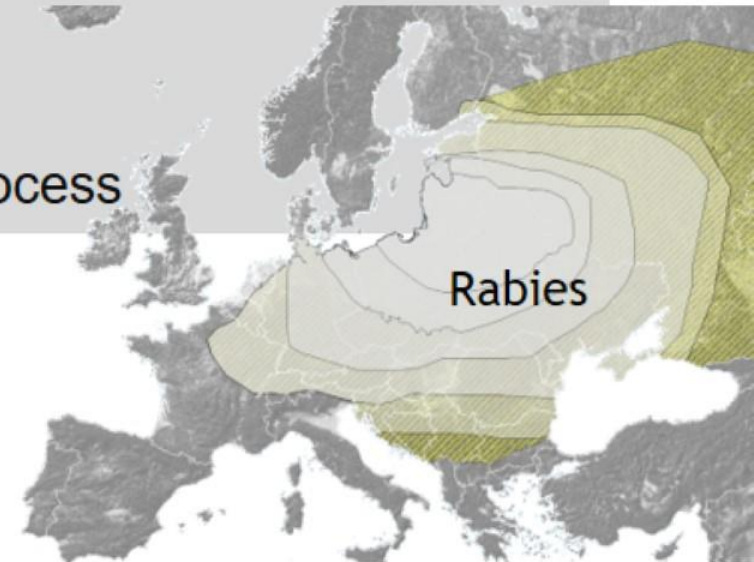
=> ASF is a “slow” disease

- ASF did not fade out
- ASF did not spread to other regions (e.g. ...)
- Lethality high
- Starting mortality low (<5%)
- Prevalence low (<5%)
- Not necessarily a density dependent process

It changed the understanding of ASF

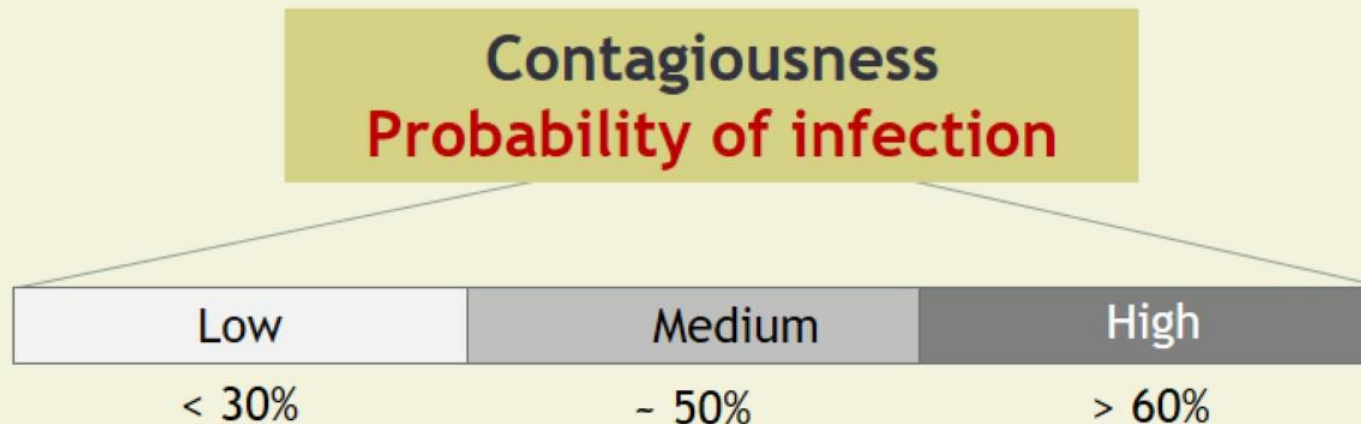
NO explosion

Endemic in the region, slow spread



Describes how easy or difficult a pathogen is transmitted (by physical contact) from one animal to another

- *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*



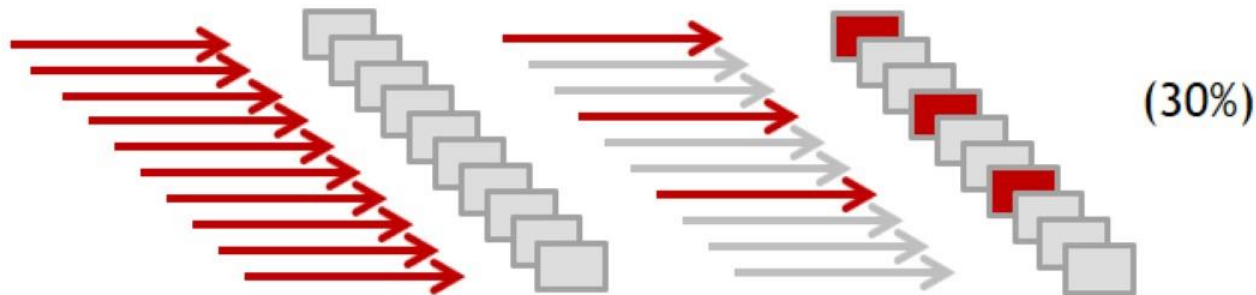
It is NOT an indicator for disease severity and impact!!!

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

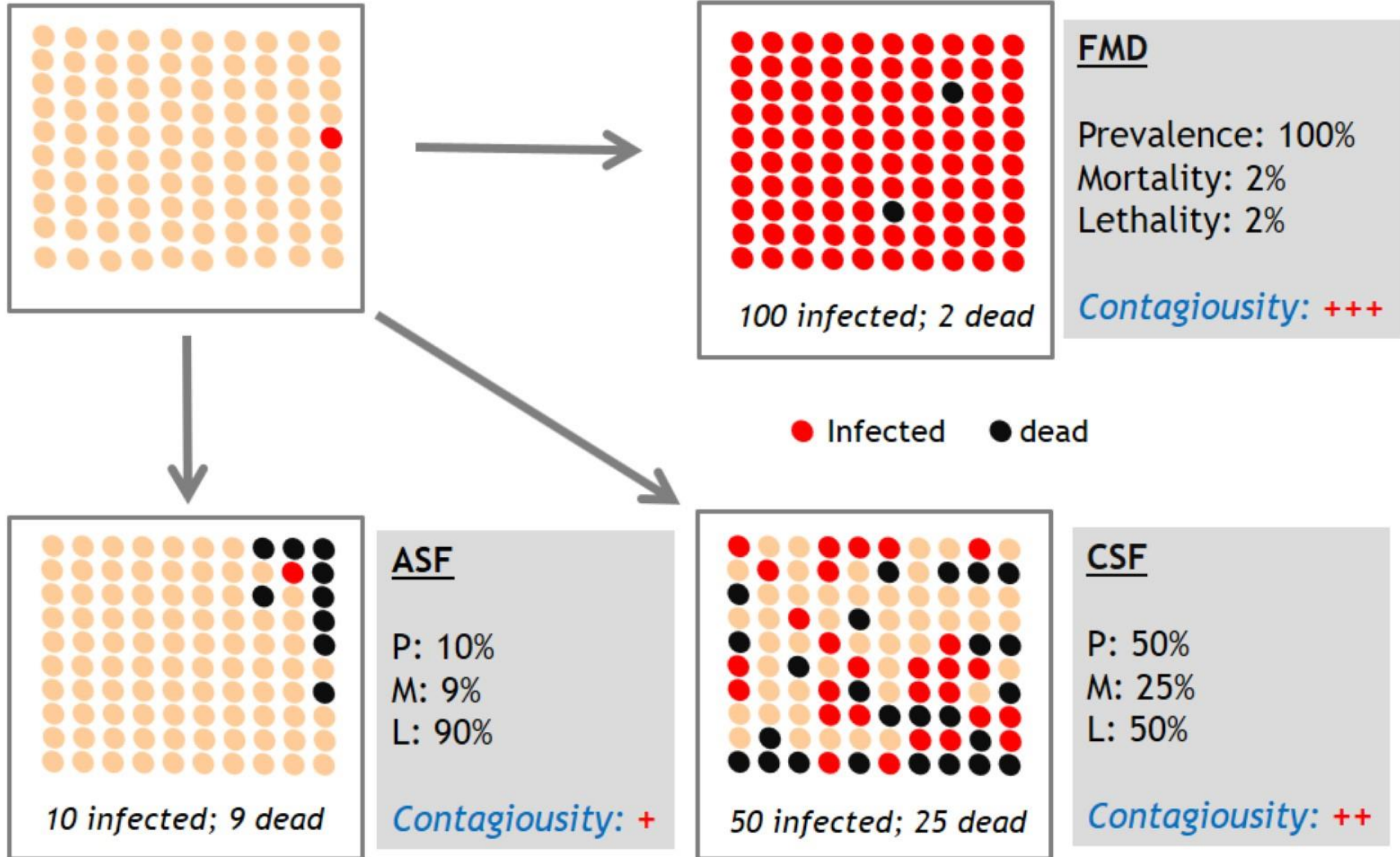
Contagiousity/Contagiousness

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



ASF - CSF - FMD



Probability of infection

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

HIGH



Contagiousness



LOW



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

Contagiousness
Percentage of animals which get infected after virus contact



ASF



Endemic situation,
slow spread,
did not fade out

CSF



Fades out
after vaccination

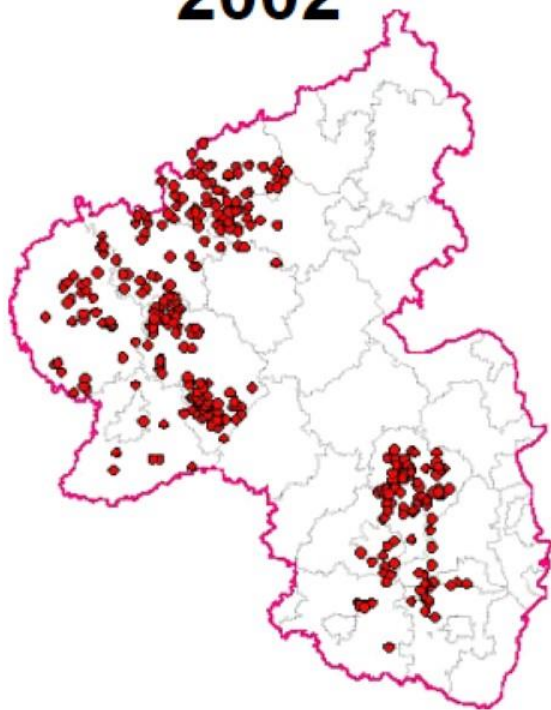
FMD



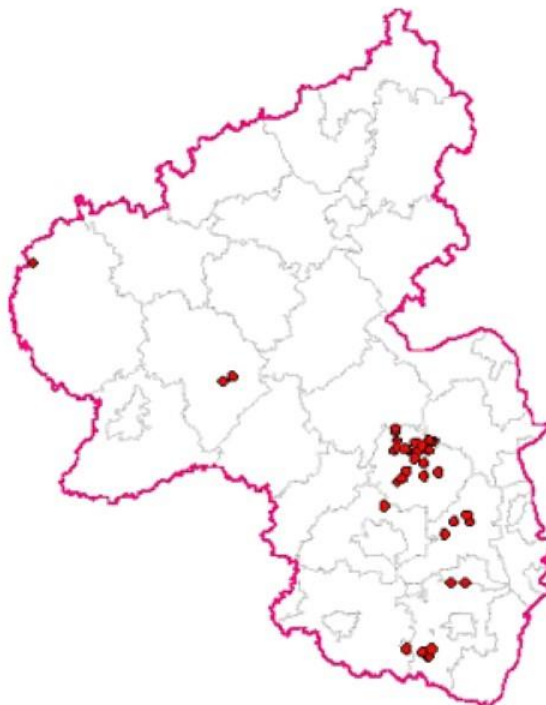
Fades out
spontaneously

CSF vaccination in Germany

2002



2003



2004



J. Blicke

FMD in WB in Bulgaria 2011

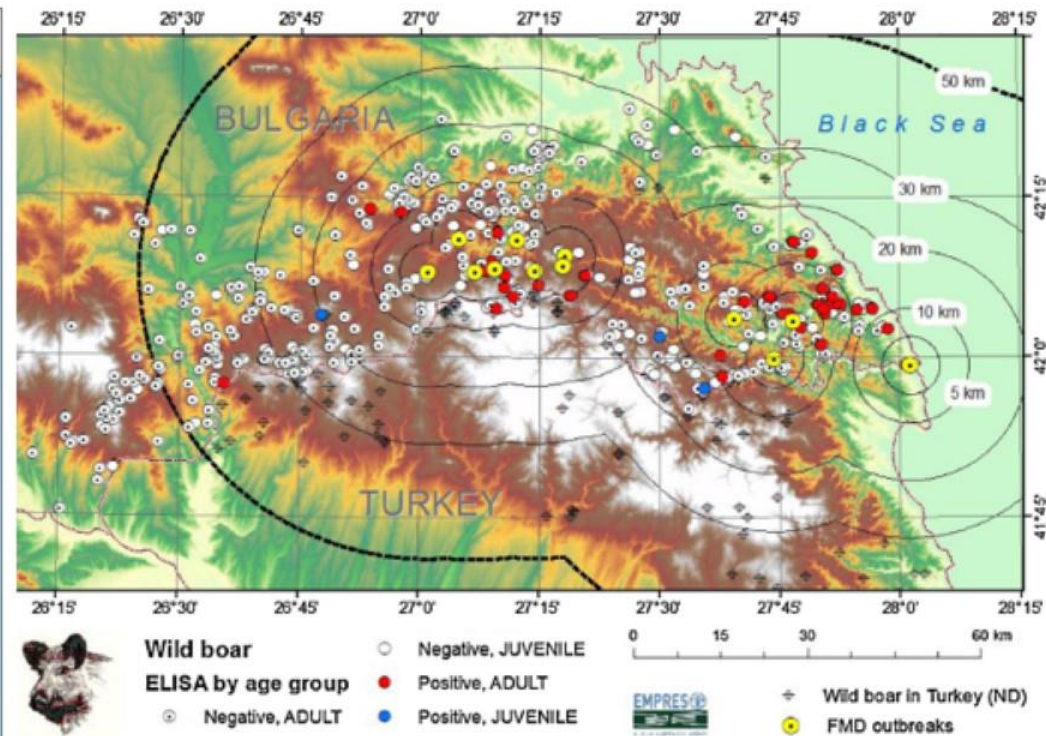
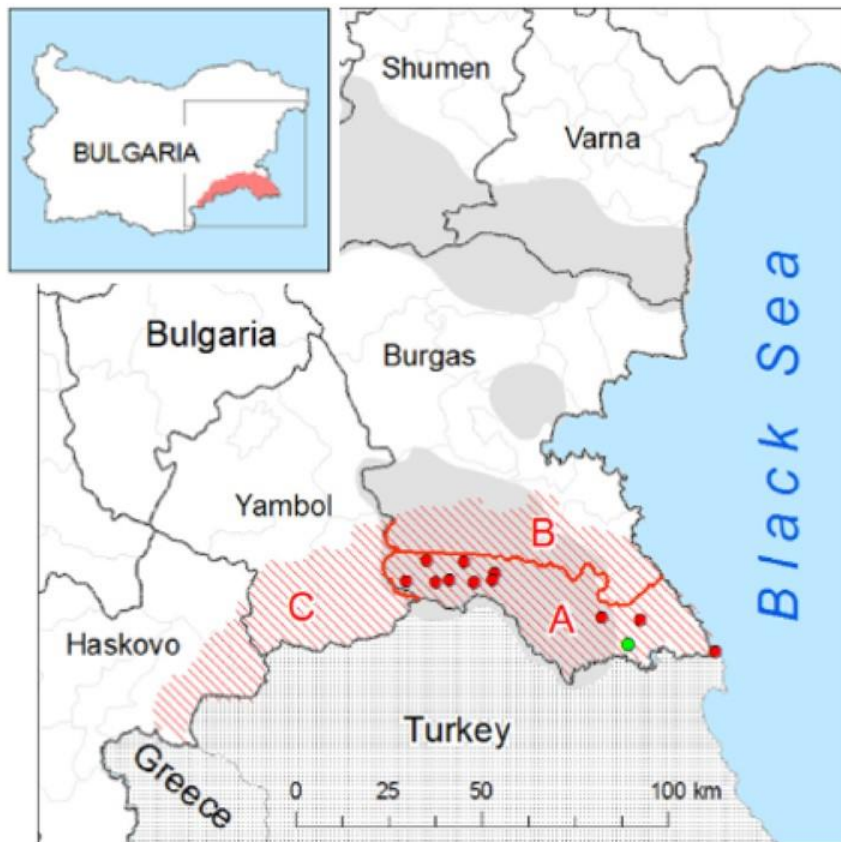
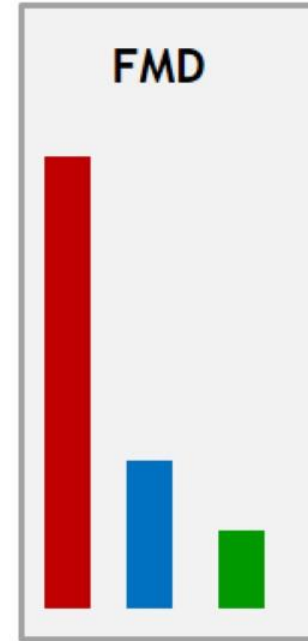
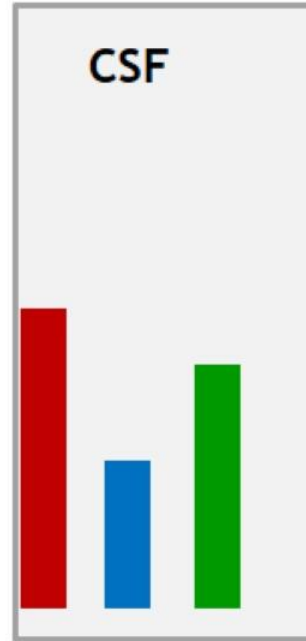
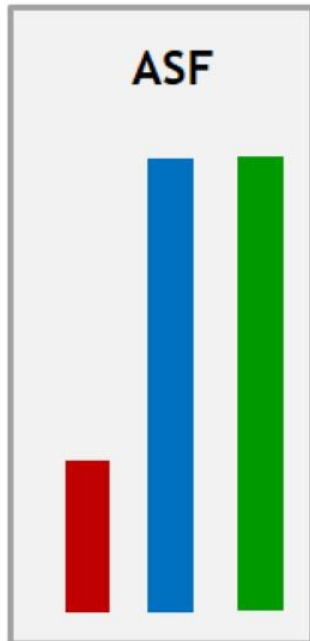


Fig. 2. Serological findings in wild boar around outbreaks in livestock.

- FMDV circulated less than 5 months (Jan – Apr 2011), than disease died out
- 812 wb sampled /12 months (2011-2012), 56 seropositive (6,9%), clustered distribution
- <2 wb/km² (Area A: 1240 km²)

FMD: highly contagious, droplet infection, tenacity low

Summary



Conatgioucity
Tenacity
Case fatality

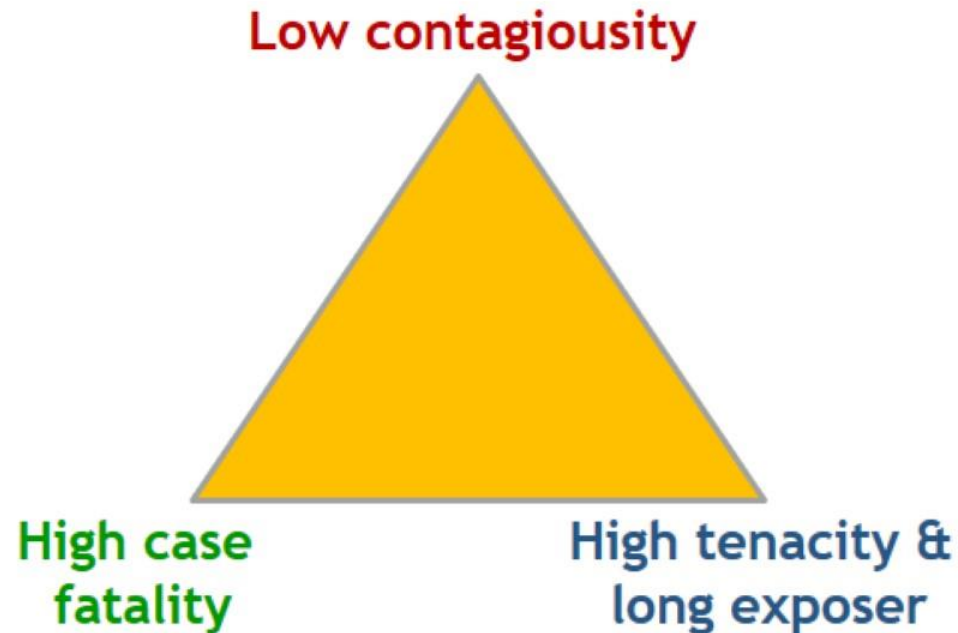
Endemic situation,
slow spread,
does not fade out

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)

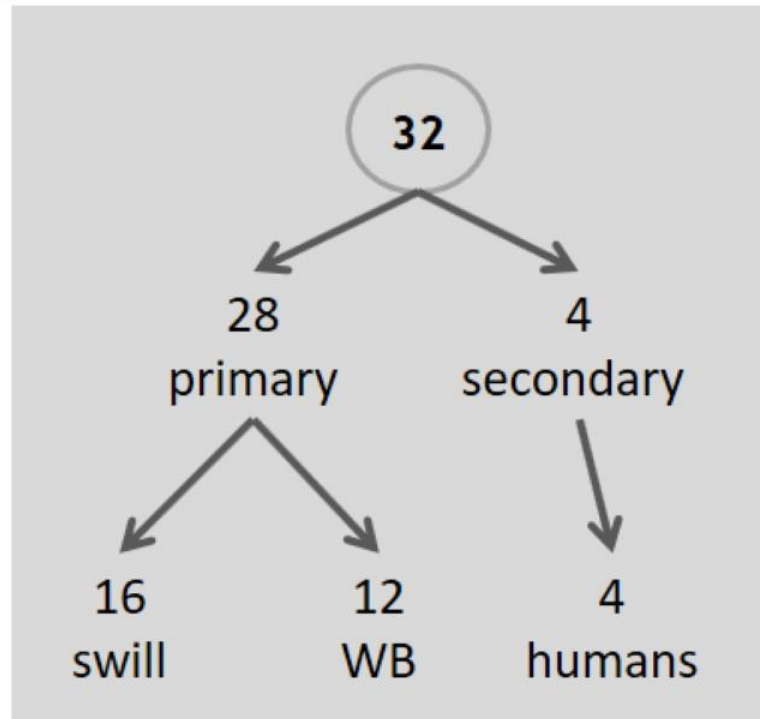


Low contagiousity: only few animals get infected

High case fatality: very few survivors & insufficient immunological protection

High tenacity: long time survival of virus in the environment, long exposer time

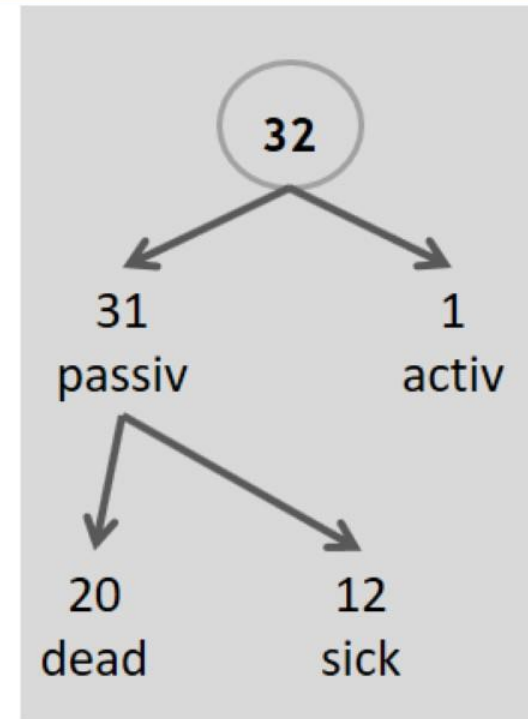
ASF outbreaks in Latvia in 2014



Experimental studies
(Pietschmann et al., 2015)

8 %

$$2 / 24 = 0,08 (8\%)$$



Field observations
(Oļševskis et al., 2015)

12 %

$$69 / 585 = 0,12 (12\%)$$

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 duration of ASF virus in any matrix.

This sturdiness has obvious implications for the epidemiology and disease control



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

Use disease parameters for surveillance
and control

(contagiousness, exposer period, ...

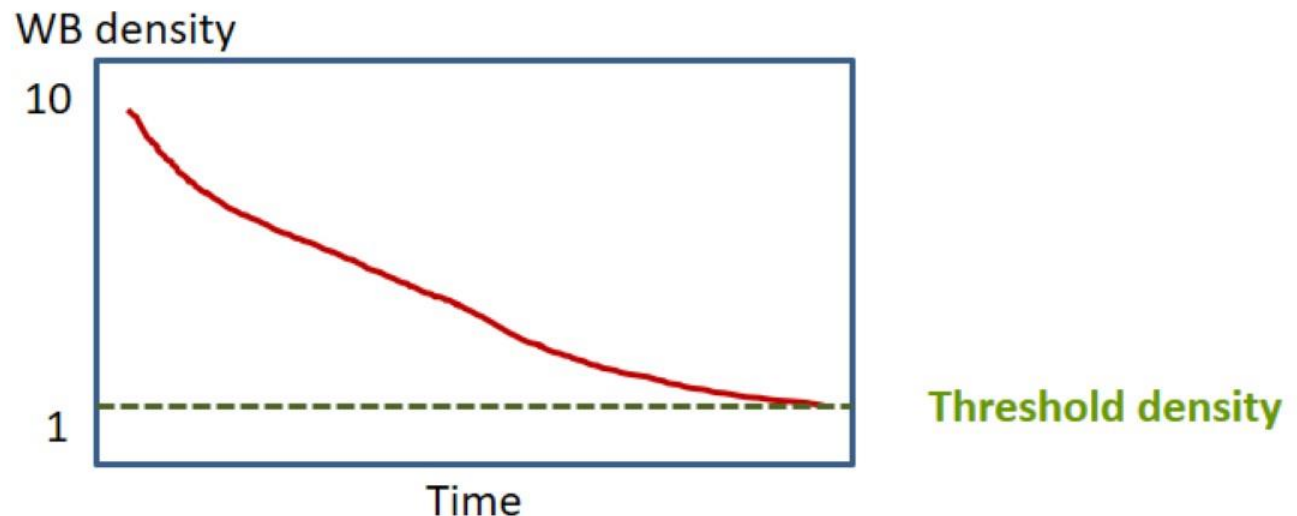
*Understanding disease and host biology
helps to draft control strategies
(threshold density)*

Can we define the threshold density?

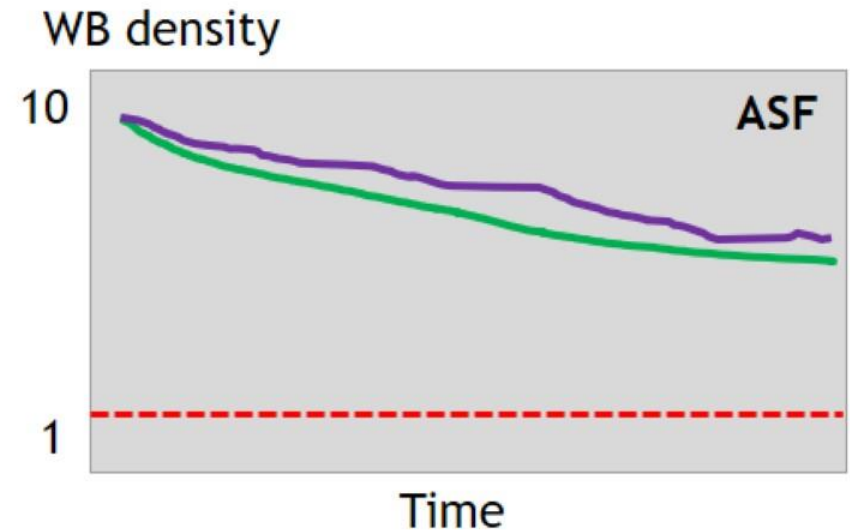
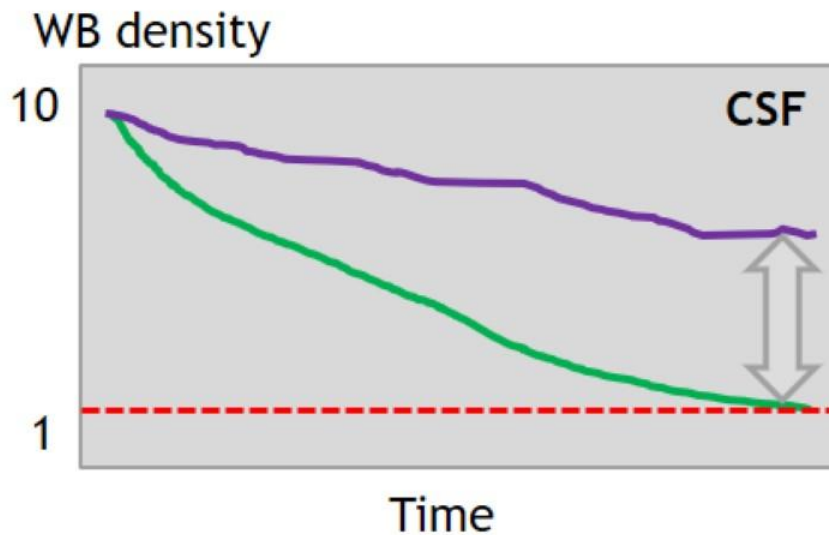
The critical density at which an infection stops (an infectious wild boar does not encounter any susceptible wild boar in due time to spread the infection)

If the number of susceptible individuals is decreased till a certain density, the infection fades out through a density dependent mechanism

NO WILD BOAR = NO DISEASE



Susceptible population & threshold



Oral vaccination

Total population
Susceptible population
Extinction

No vaccination
*(high case fatality,
few survivors)*

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

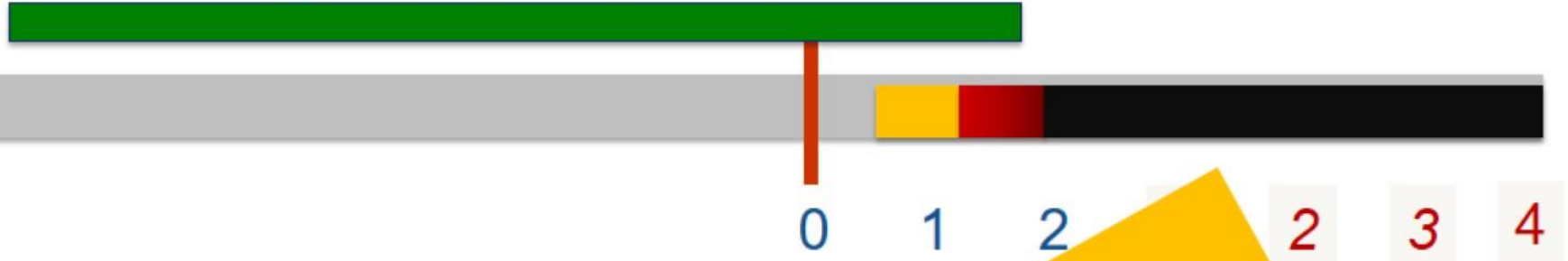
	tested	positive	% <i>positive</i>
<i>Passive (found dead)</i>	245	177	72.24
<i>Active (hunted)</i>	2765	40	1.45
		217	

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)

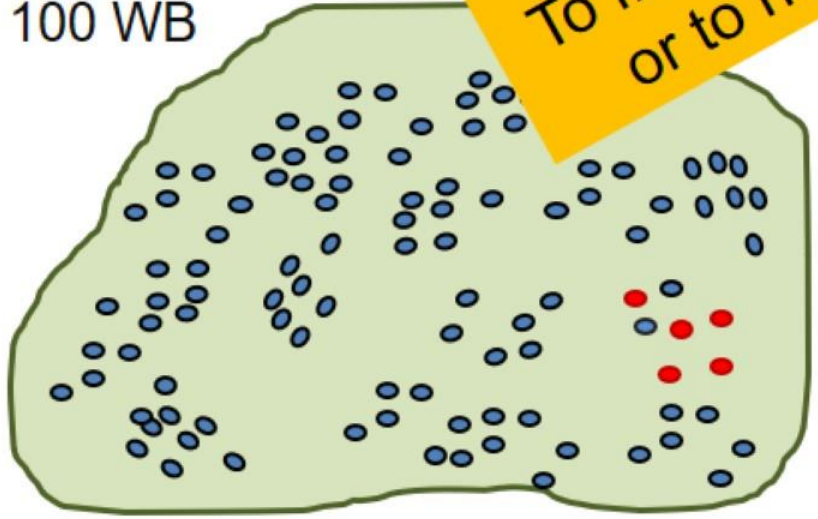
Period during which a WB can be hunted



What is more difficult?
To find and sample one dead WB,
or to hunt and sample 45 WB

detected diagnosis,
→ 4 weeks (PCR +)

100 WB

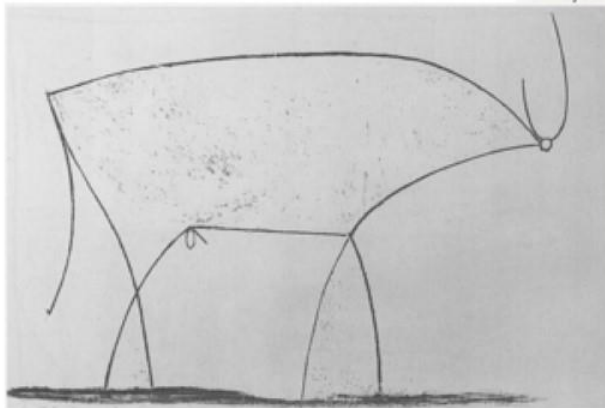
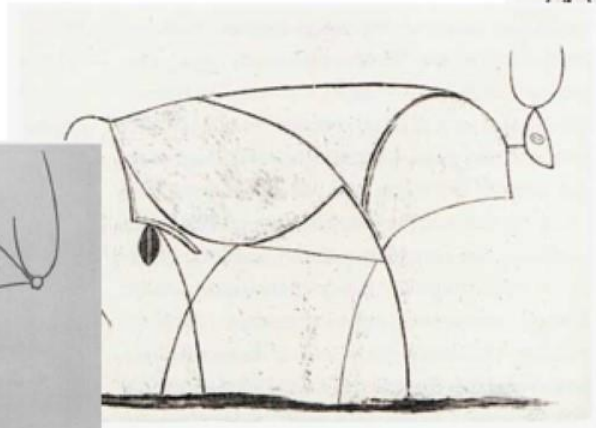
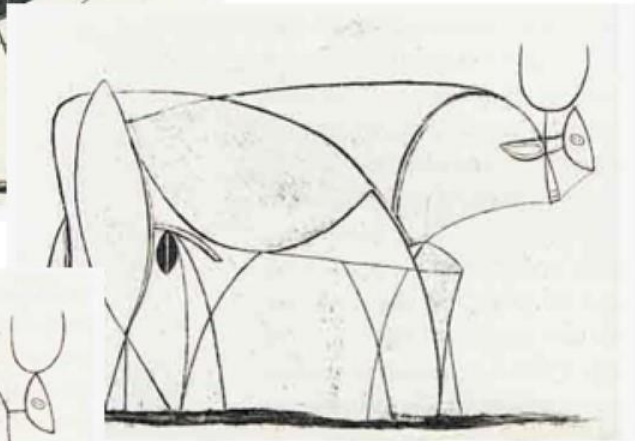
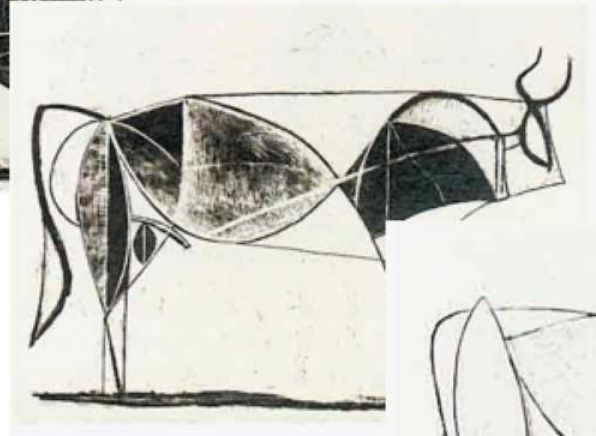
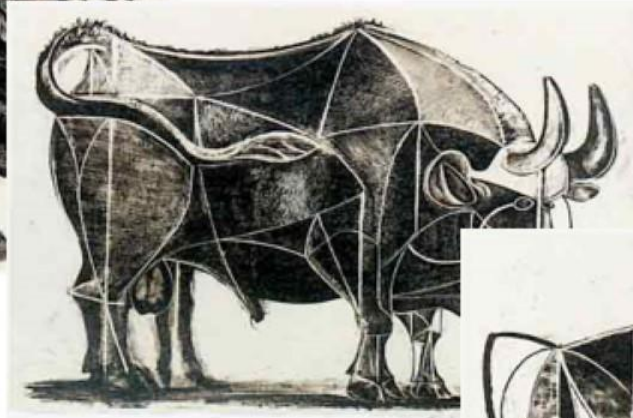
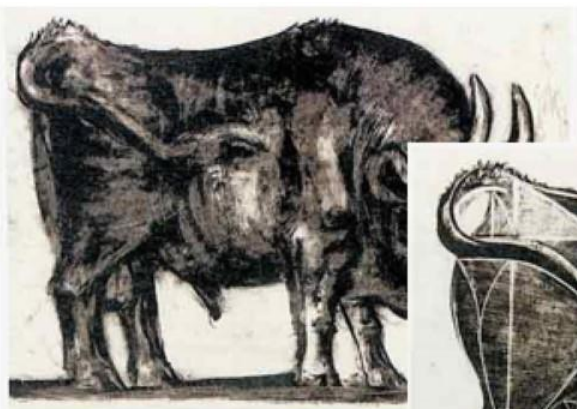


5 of 100 infected (5%)

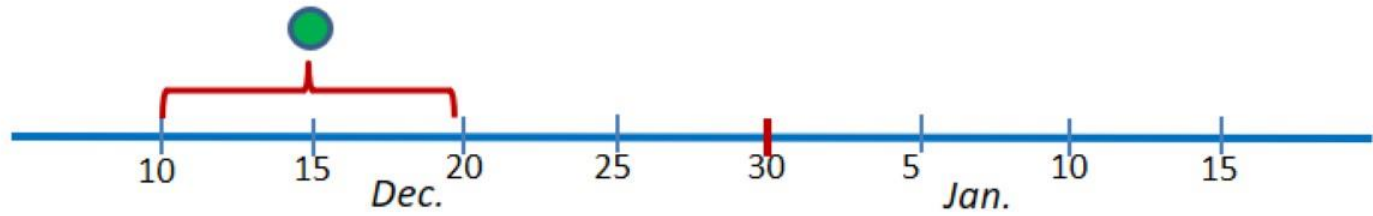
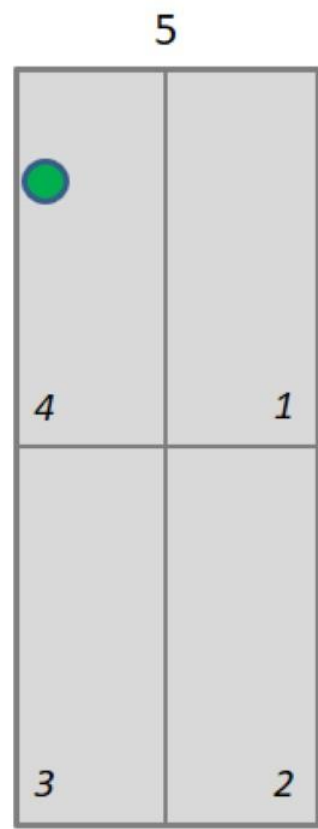
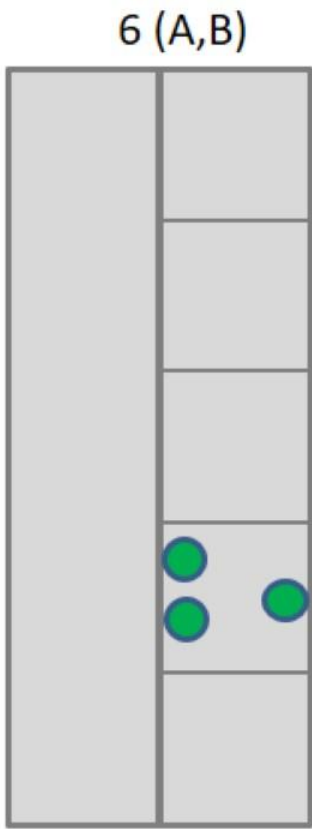
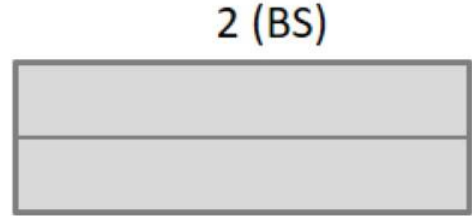
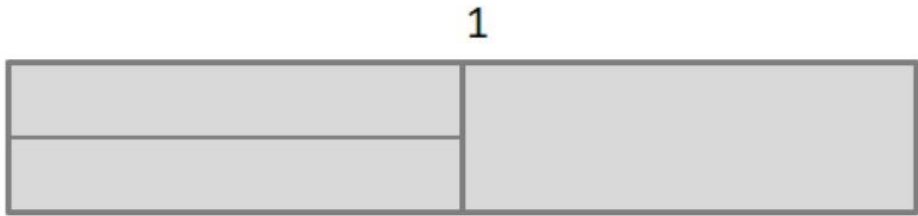
5/95-Concept

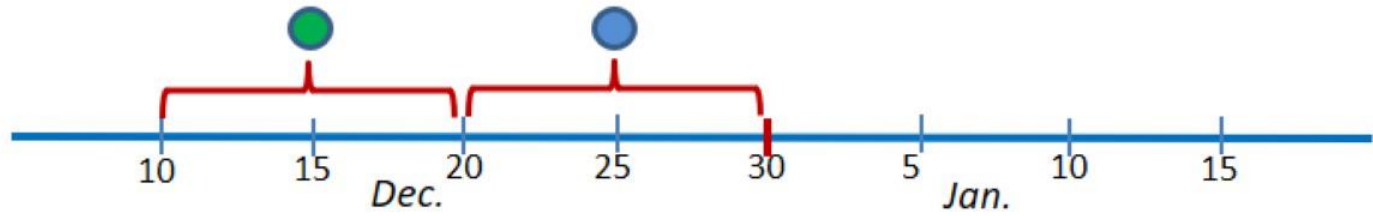
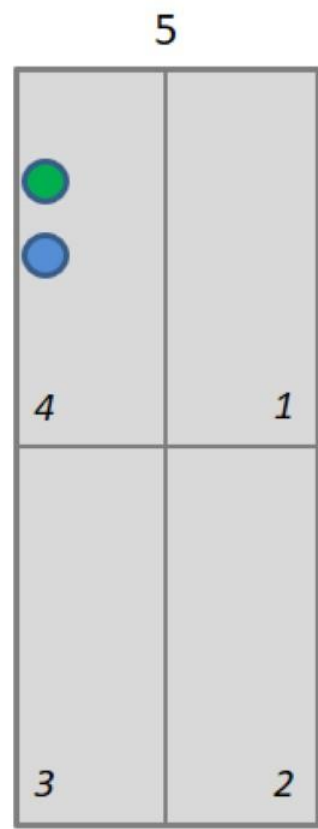
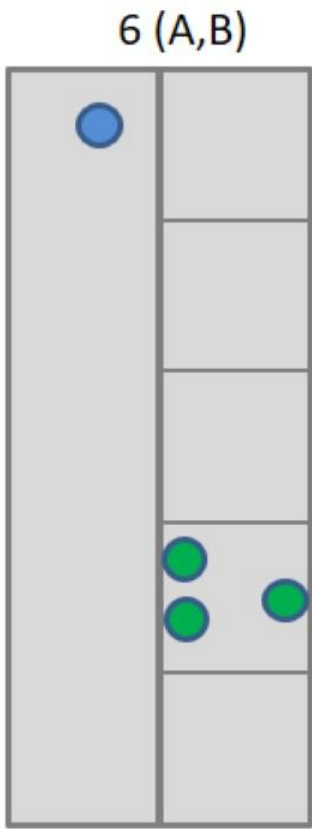
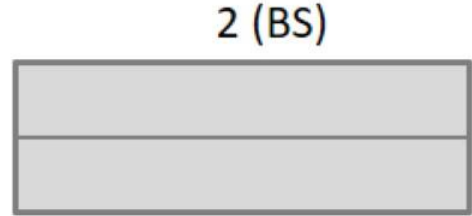
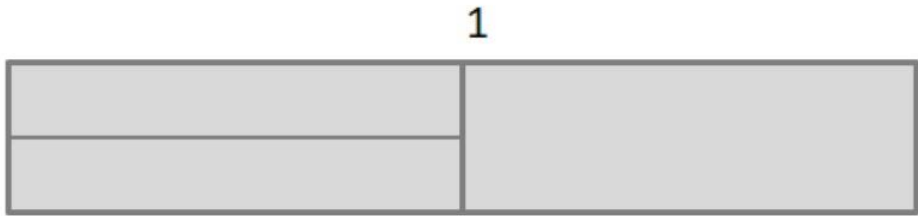
On the day of sampling 5 out of 100 WB (5%) are incubating ASFV. To find at least 1 positive WB 45 have to be sampled same day (95% confidence)!

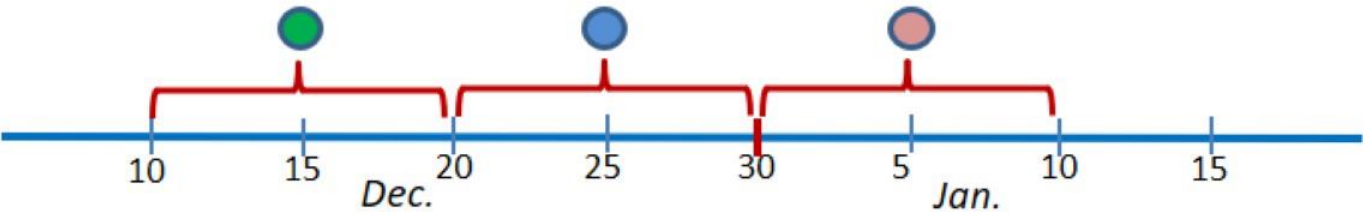
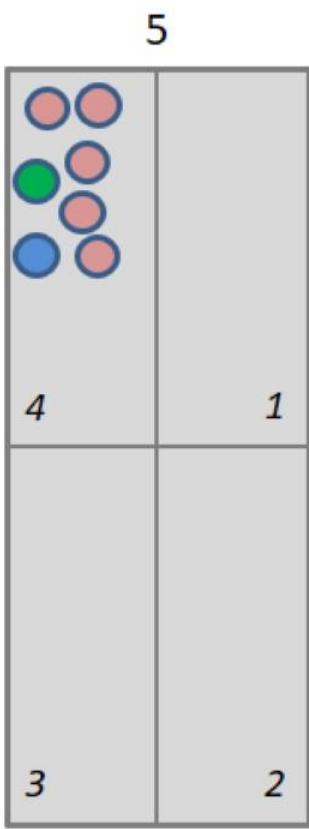
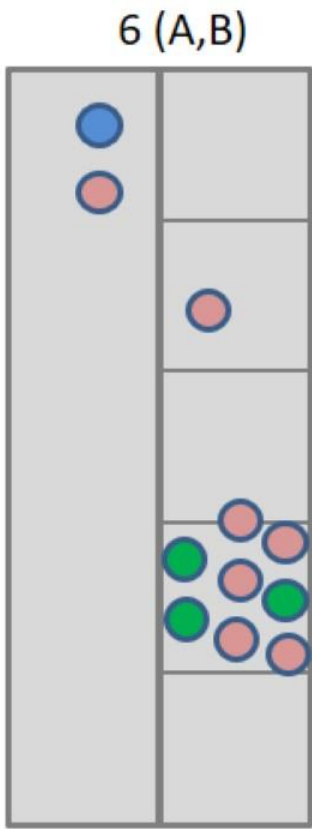
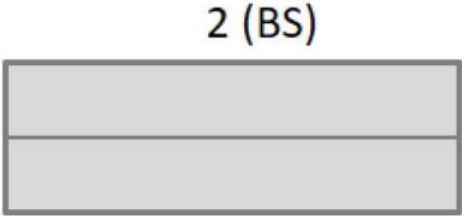
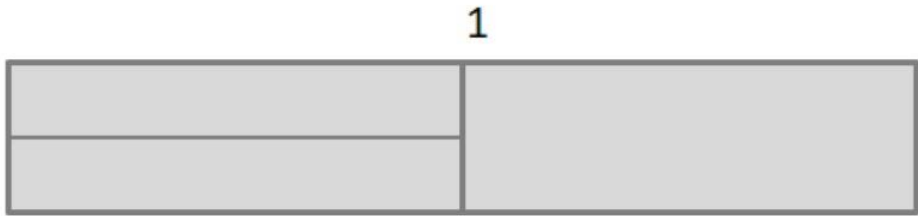
(Prevalence of 2% -> 78 WB have to be sampled (1% ... 96 WB...))

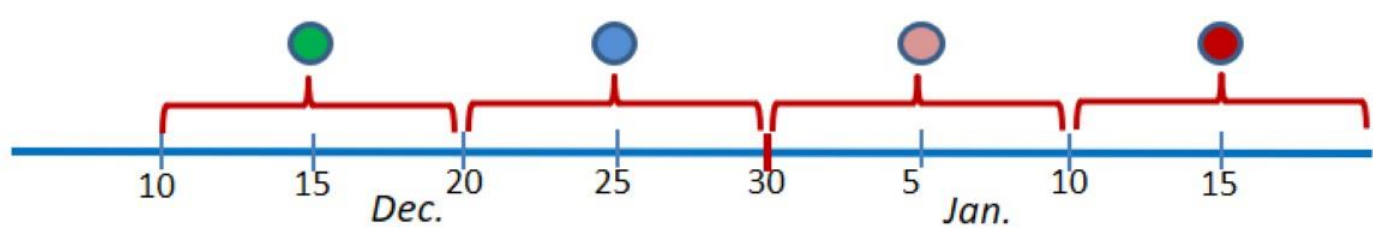
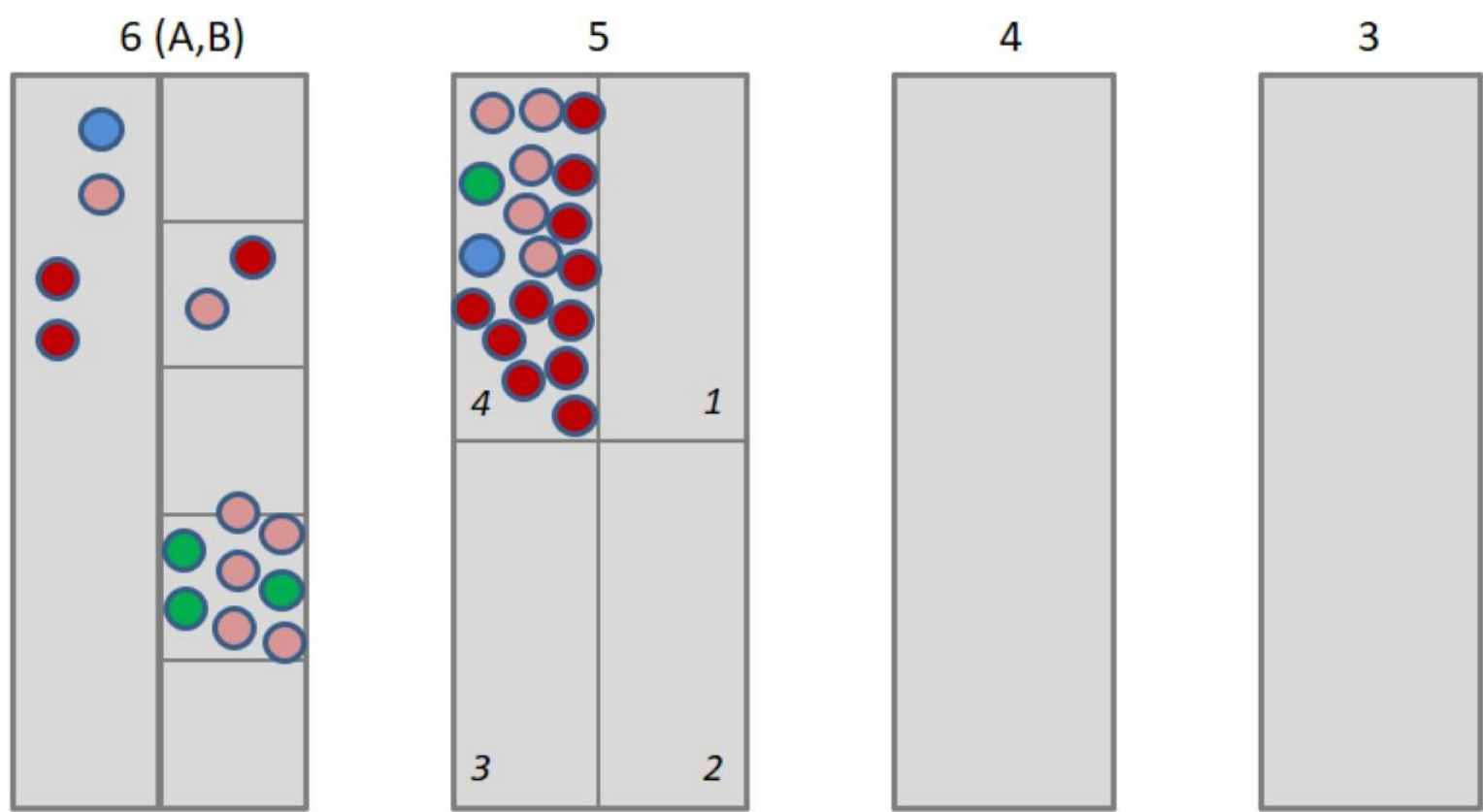


Picasso

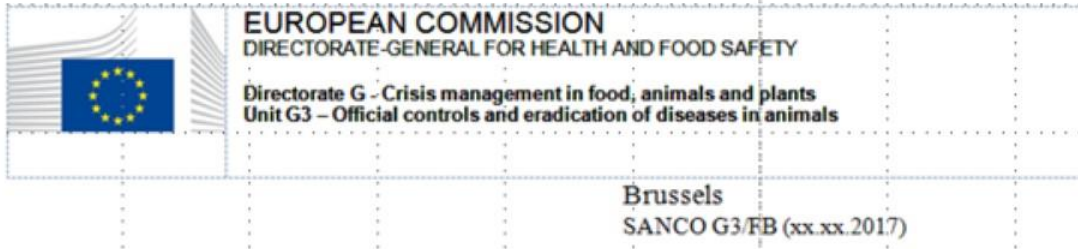






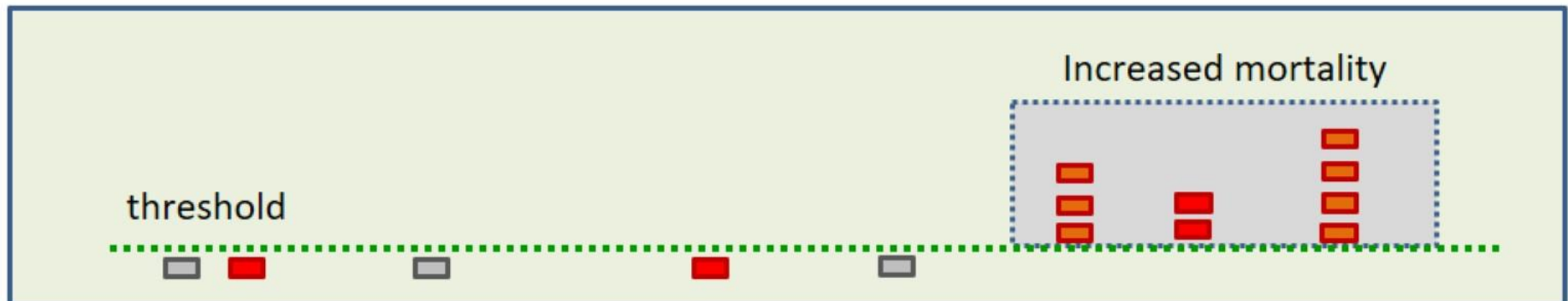


SCoPAFF 6./7. April 2017; AHW_A.0!

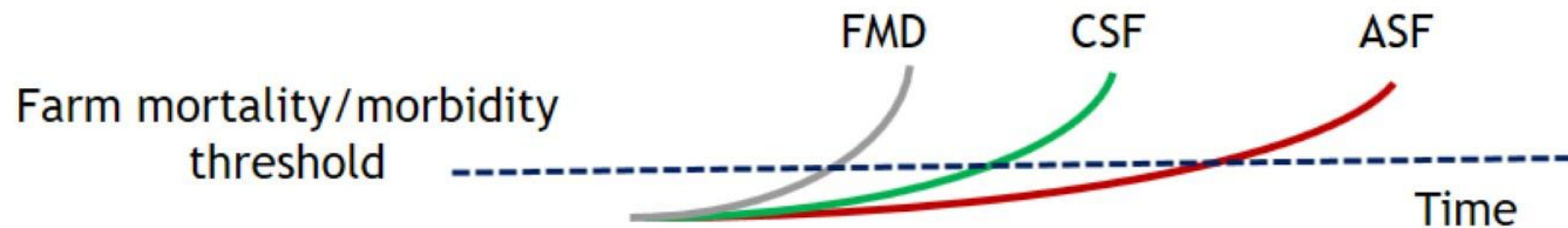


2.1.5. Sampling for laboratory investigations will be performed

- ~~in~~In case of clinical signs (such as fever or haemorrhagic lesions).
- Each week, virological testing of at least the first two death (post weaning pigs or pigs older than 2 months) in each production unit~~All dead pigs to be sampled and tested.~~
- Ante or post-mortem signs raising suspicion at home slaughtering at least within the area covered by Commission Decision 2014/709/EU.



High Risk Period (HRP)



Low contagiousity => low (initial) mortality

ASF remains undetected in large pig farms (below the normal mortality threshold)

HRP -> farm size

- *back yard: rather short*
- *large farm: rather long*

Biosecurity

the most effective control tool

The only potent tool we have...

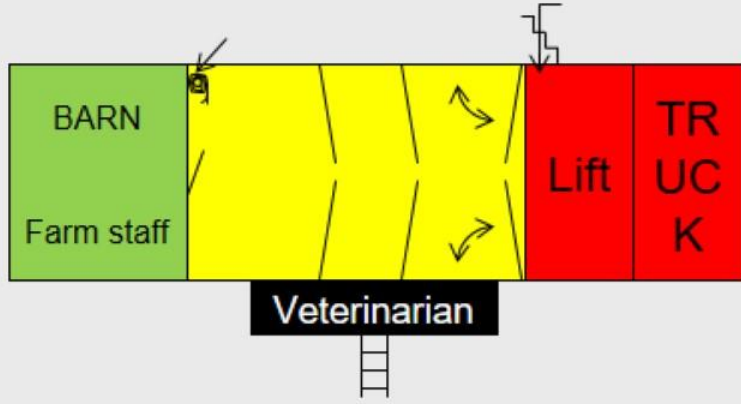
- *Africa - double fencing*
- *Three golden rules of biosecurity*

Biosecurity

Hardware



Software (Mindset/Philosophy)



Good news: no (rapid) spread of the disease

ASF in domestic pigs can be controlled effectively!!!

Bad news: The infection survives locally over months or years in wild boar populations

Slow spread

- *No rapid epidemic wave*
- *No airborne transmission*

Low contagiousity (<20 %)

- *Low mortality*
- *Low prevalence*

Local event

(no/few secondary infections)

- *Habitat disease (WB)*
- *Stable disease (DP)*

Facilitates successful eradication

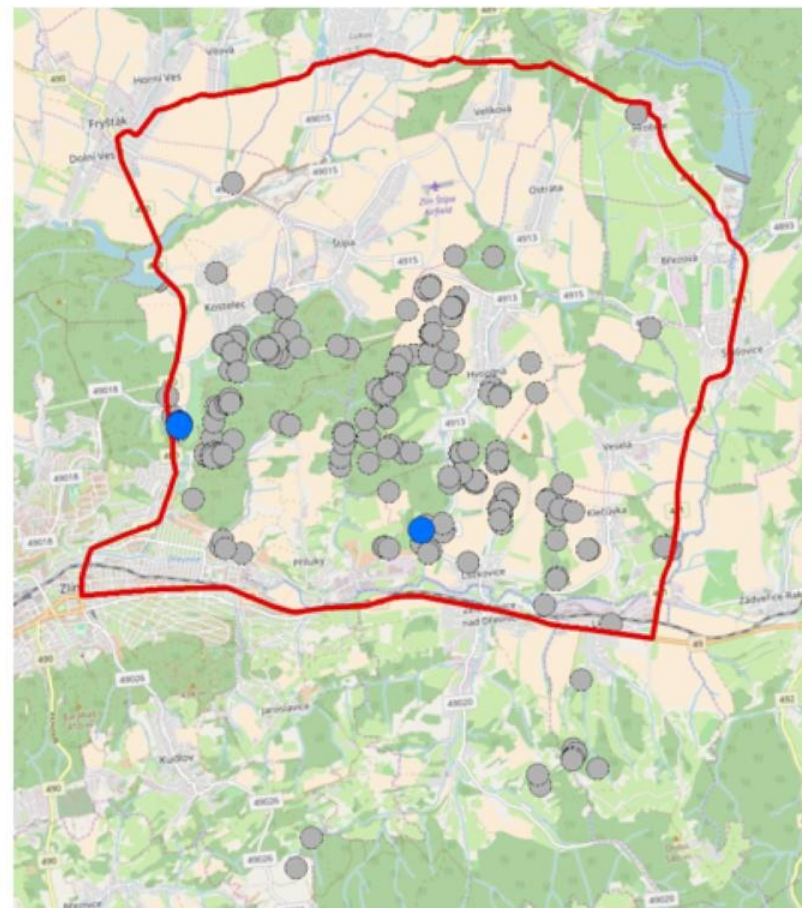
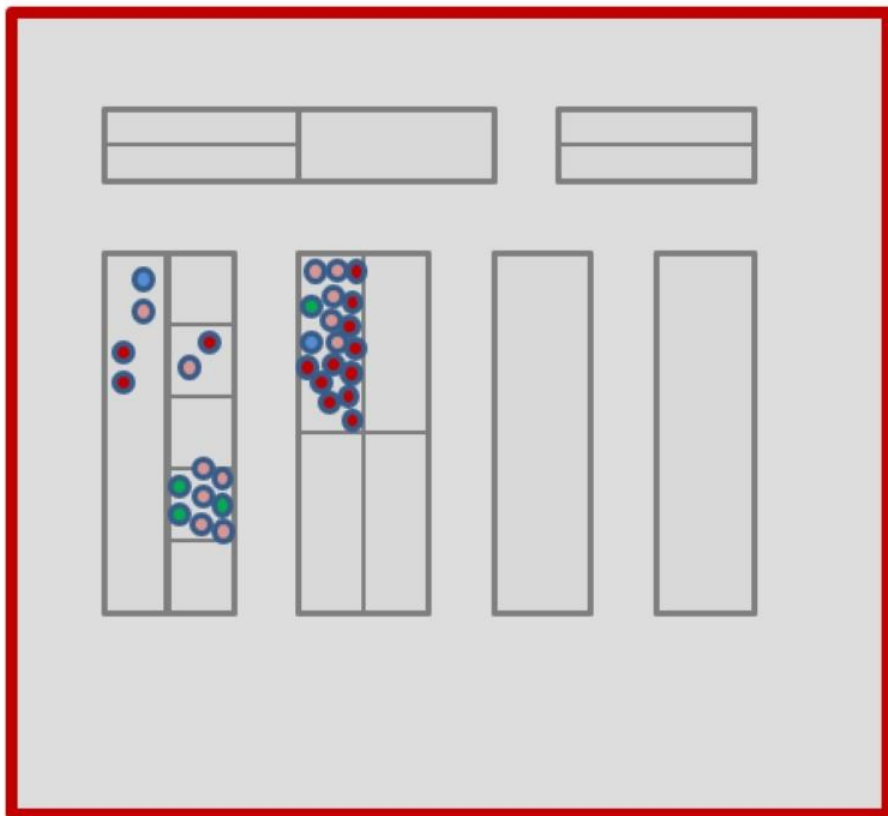
DP:

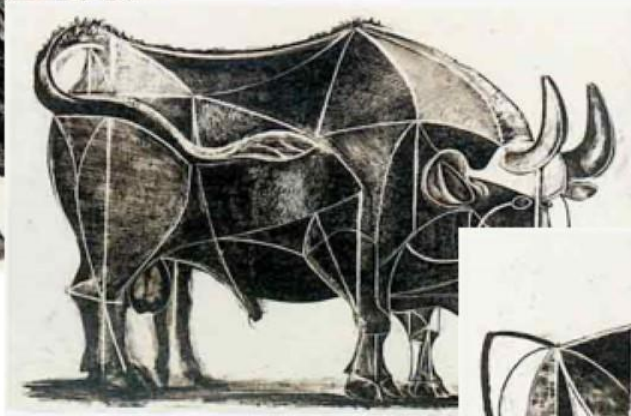
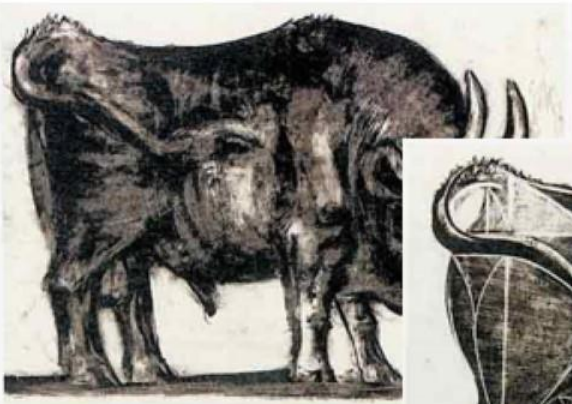
- *Segregation*
- *Standstill*
- *Culling*
- *C&D*

WB:

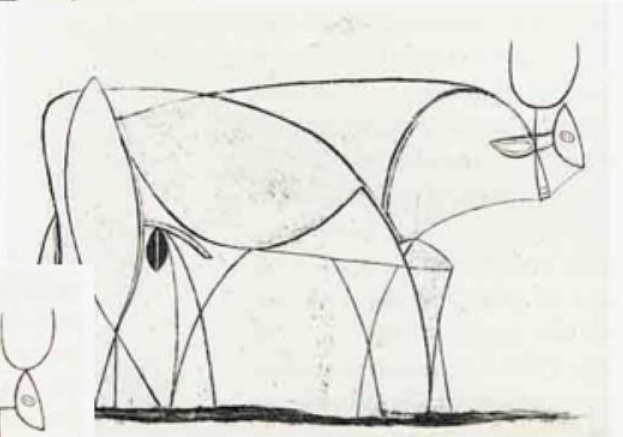
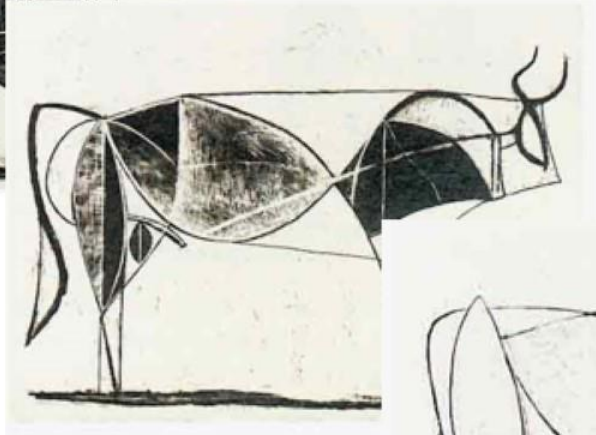
- *Segregation → electric fences*
- *Standstill → no hunting, (feeding)*
- *Culling → trapping, removal of carcasses*
- *C&D → biosecurity*

“Virtual stable” in forest



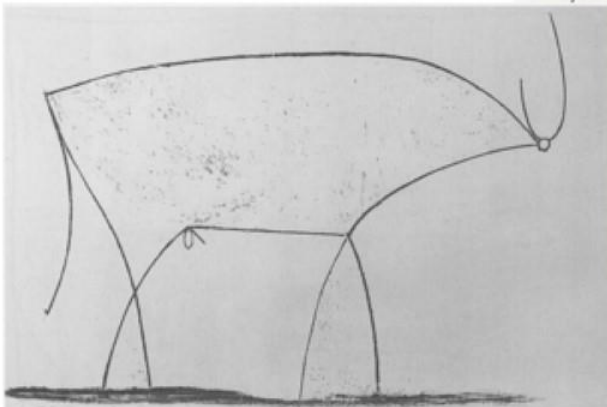
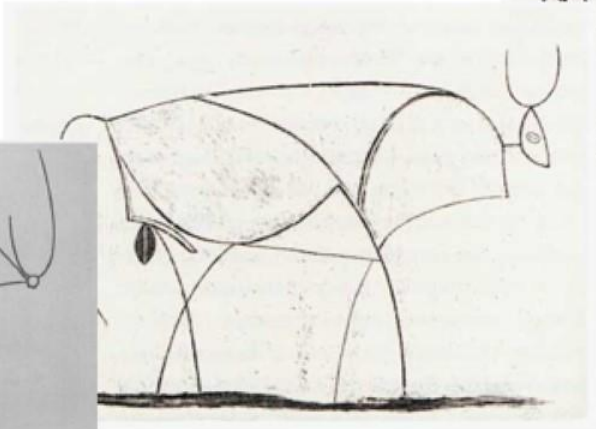


Thank you!



A special thanks to:

- Baltic friends (*Kristine, Edvins, Martins, Marius, Arvo, Imbi...*)
- Vittorio
- My colleagues (*Anja, Klaas, Carolina, ...*)



Picasso