

EpiX Analytics ASF project in Vietnam: “EpiX ASF Risk”

Webinar: Optimization of testing strategy for ASF on-farm surveillance

March 17, 2020



- Please turn off cameras to save bandwidth
- Please remain muted except to ask / answer questions (remember to mute yourself again after talking)
- Questions are allowed during the presentation, and we will also have a Q&A session at the end
- We are recording the webinar and share the link to access it afterwards

Project overview

- Objective: support efforts to mitigate the spread of ASF in Vietnam
- Two-year project, started in July 2019
 - Funded via a grant from the USDA-FAS
 - Project team working independently but in close collaboration with Vietnamese stakeholders (industry, veterinary authorities, university)
 - Support of the USDA-APHIS team to coordinate activities in Vietnam

Key team members

- EpiX Analytics:
 - Project leader and ASF expert: Dr. Solenne Costard
 - Modeling and epidemiology team
 - Dr. Francisco Zagmutt, Dr. Solenne Costard, Dr. Huybert Groenendaal, Dr. Jane Pouzou
- Epidemiology expert: Prof. Andres Perez, U of Minnesota



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Project activities

1. Epidemiological and risk-based analyses
 - In collaboration with stakeholders
 - Using **existing data** / information from Vietnam
 - **No field visit / data collection** component

2. Visits:
 - Typically, 1-2 days workshops +/- meetings with specific partners
 - Short training courses customized for collaborators
 - Topics depending on on-going activities, may involve external experts
 - Review of project analyses and how they inform ASF control strategies
 - Tentative timing of next visits: ASAP, August '20, January '21, May '21



Webinar objectives - today

- Webinars organized as ‘remote support’ while waiting to reschedule the workshop initially planned in March
 - Timing of next webinars:
Tuesdays, at 7-8am, 8-9am, or 8-9pm?

- ASF control options for the industry

Context

Partitioning and on-farm surveillance for ASF in Vietnam

- Making the best use of current MARD testing requirements

Introduction to non-technical concepts (details in next webinars)

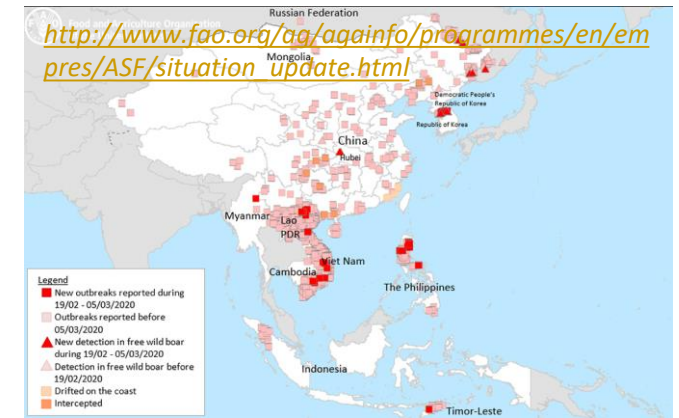
Example scenarios for illustration & discussion



Context

- ASF is becoming endemic in VN
- Successful eradication is very difficult.

It requires large resources, collaboration between and efforts from both veterinary authorities and the pig industry.



- Example of Spain:
 - ASF was endemic (pigs + boar + ticks) in Iberian peninsula. Only region that eradicated disease after it had become endemic.
 - ASF introduced 1960s, free status regained 1995
 - Official eradication program '85-'95
 - Substantial investment required - €11.4 million costs to Spain in 1983, EU provided €43 million in 1985

Spain: Endemicity to Eradication

- Key eradication program elements:
 - 127 mobile field vets dedicated to program
 - 100% of farms under serological surveillance
 - Elimination of all outbreaks (stamping out)
 - Compensation at market value
 - Improved production and animal holding facilities

- In the 1960's, pig production: largely backyard, non-industrialized
 - Acorn foraging in oak forests is still important for traditional *jamón ibérico*
- With economic growth + joining EU in 1986, production was scaled up, and ASF control efforts reinforced
- Note: **Attenuated vaccine impeded the control efforts:** not safe, produced chronic infections and asymptomatic carriers, and conferred only partial protection



Jamón Ibérico Photo by By K.Weise - Own work, CC BY-SA 4.0

Pig production system changes in Spain while working on ASF control

- Spain's pig population increased by 50% from 1970 to 1985
- Exports: 1986 - 5,787 tons; 2017 - 2.2 million tons.
- Spain now the largest producer of pigs in Europe and third-largest in the world. Sow population of 2.41M.
- The evolution of the pig industry in Spain was in some ways symbiotic with ASF control:
 - facilities became modernized, with high biosecurity
 - production became more integrated
 - surveillance and disease control measures were stepped up
 - demand for pork grew



Image from jamon.com



Image from modernfarmer.com

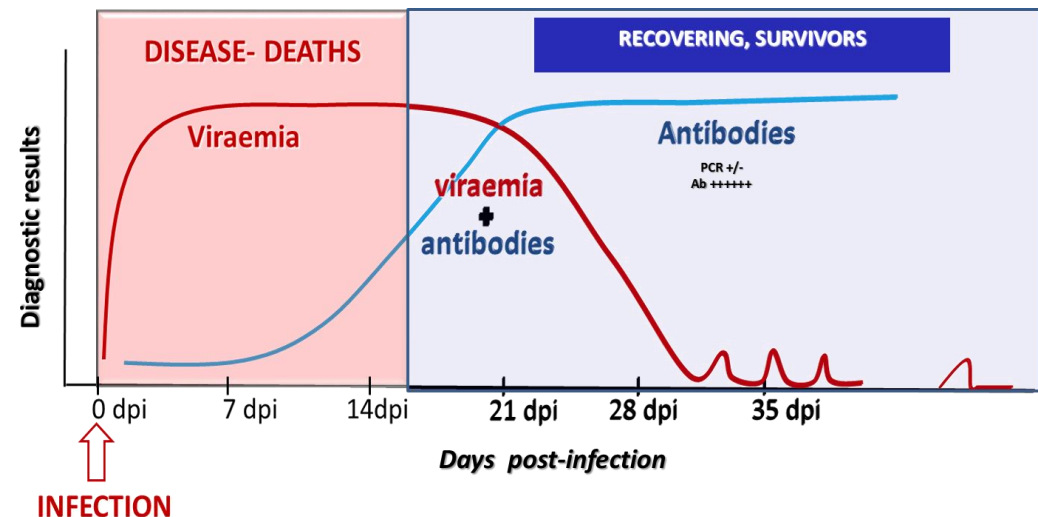
Proposed approach for industry in Vietnam: 'Partitioning'

- Concept/objective: maintain ASF-free farms in an ASF-affected area
- Why?
 - To manage the ASF risk and limit its economic impact on a production system
 - Potentially, to add value to pork products ('safe production' etc.)
- See online material from previous workshop (November 2019) for [more details](#)
- Same principle as compartmentalization for trade (OIE), but without the regulatory implications
 - Means / Requirements:
 - Biosecurity practices program for prevention of ASF introduction
 - Definition of Standard Operating Procedures + record keeping
 - Compliance with biosecurity rules
 - On farm surveillance / Monitoring
 - Early detection of disease: active surveillance - symptoms, testing
 - Swift control in case of introduction
 - Definition of Standard Operating Procedures
 - Verification that procedures well implemented and efficient
 - Training to ensure all relevant people are knowledgeable
 - HACCP / risk analysis approach

Identified as priority during
the November '19 workshop

On-farm surveillance

- Objectives:
 - Early detection of the disease in case of introduction
 - Critical to ensure ASF can be controlled before it spreads further (on or beyond the farm)
- Method: actively look for the disease
 - Health monitoring: clinical signs, temperature checks
- Testing:
 - Different tests for different goals
(more details at webinars #2 & 4)
 - For early detection of ASFV, tests targeted at ASFV genome / Ag



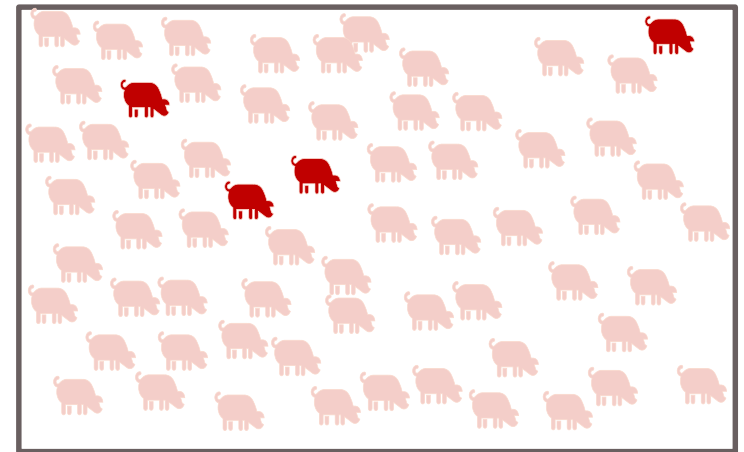
Current MARD testing requirements for ASF

- Samples to be taken from animals that are to be moved/sold (after test results)
- MARD Document #3708 issued 05/28/2019 on slaughter pigs:
 - Number of samples:
 - Batch with <100 : 5 samples
 - Batch with 100 – 300 : 15 samples
 - Batch with >300: 30 samples
- MARD Document #4249 issued 06/18/2019 on breeding stock (transfer/sale):
 - Number of samples
 - Farm size <100: 15 samples
 - Farm size over 100 pigs : using 10% disease prevalence
 - Diagnostic:
 - Pooling (5 samples)
 - Realtime PCR (OIE-recommended test)
 - Turn-around time for results is 3-5 days

Tổng đàn	Tỷ lệ mắc bệnh dự đoán						
	0,1%	0,5%	1%	2%	5%	10%	20%
50	50	50	48	48	35	22	12
100	100	100	96	78	45	25	13
200	200	190	155	105	51	27	14
500	500	349	225	129	56	28	14
1.000	950	450	258	138	57	29	14
5.000	2253	564	290	147	59	29	14
10.000	2588	581	294	148	59	29	14
> 10.000	2995	598	299	149	59	29	14

Example scenarios re ASF sampling & testing

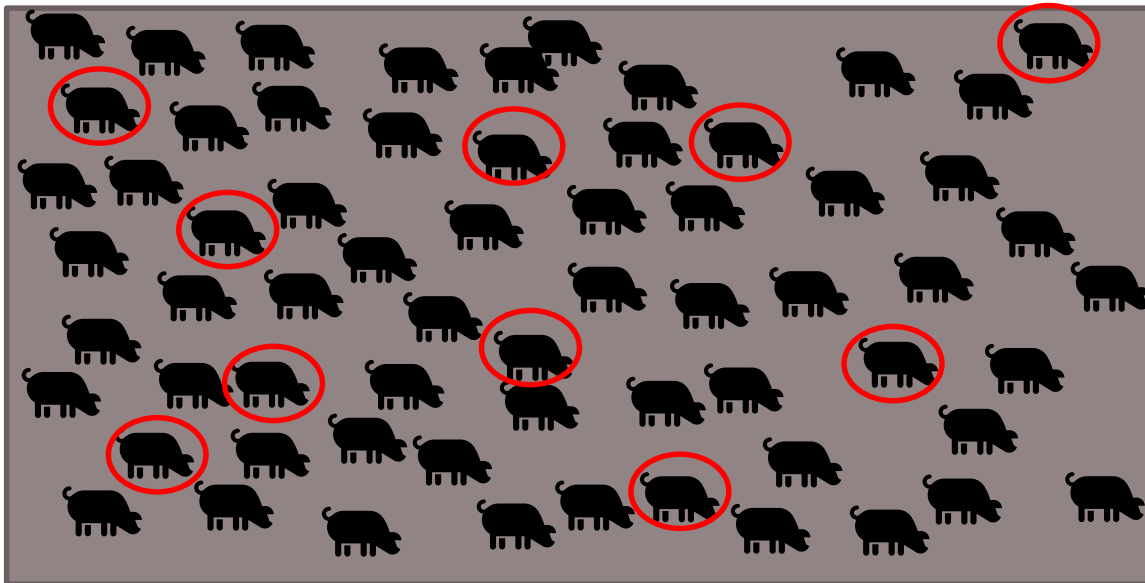
- Objective of scenarios in next slides:
 - Introduce concepts that will be covered in more details in **webinars #3 & 4**
 - Non-technical discussion today
- However, a few terms need to be defined:
 - Prevalence: proportion of population affected
e.g. $4/64=6.25\%$
 - Detection level: lowest prevalence that can be detected with a given method/test
e.g. for MARD Document #4249, 10% prevalence
 - Confidence level: the probability that the results (or disease status) is true
 - Test sensitivity: ability to correctly identify animals with the disease



Example scenario #1

W2F Site; 500 finishing pigs in a building, ready to be sent for slaughter

30 blood samples



What information do you get?

Detection level: 10% in the building

Confidence level: 95%

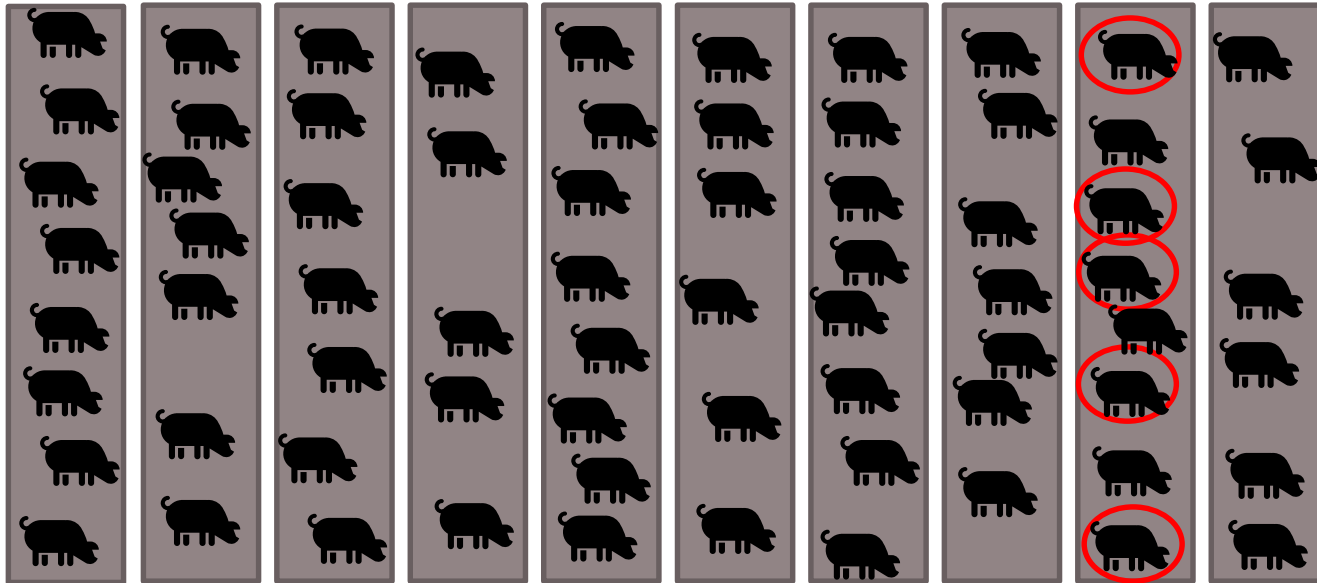
(Samples from 30 animals
from the building with 500 slaughter pigs,

with a 90% sensitive test - PCR on 5 pooled
samples*)

Example scenario #2

W2F Site; 500 finishing pigs across 10 rooms/buildings ready for slaughter

30 blood samples, from 1 room



What information do you get?

Detection level: 7% in the room

Confidence level: 95%

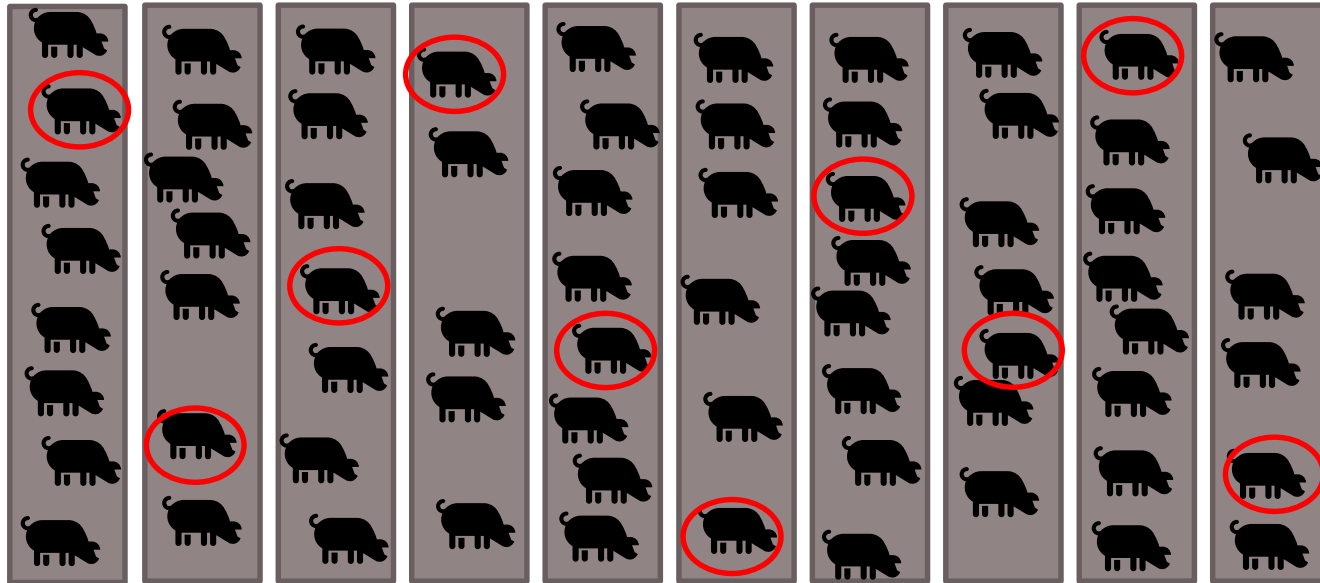
(Samples from 30 animals
from one room with 50 slaughter pigs,

with a 90% sensitive test - PCR on 5 pooled
samples)

No/little information on other
rooms/buildings

Example scenario #3

W2F Site; 500 finishing pigs across 10 rooms/buildings ready for slaughter
30 blood samples, 3 from each room with 50 pigs



What information do you get?

Detection level: 80% in each room

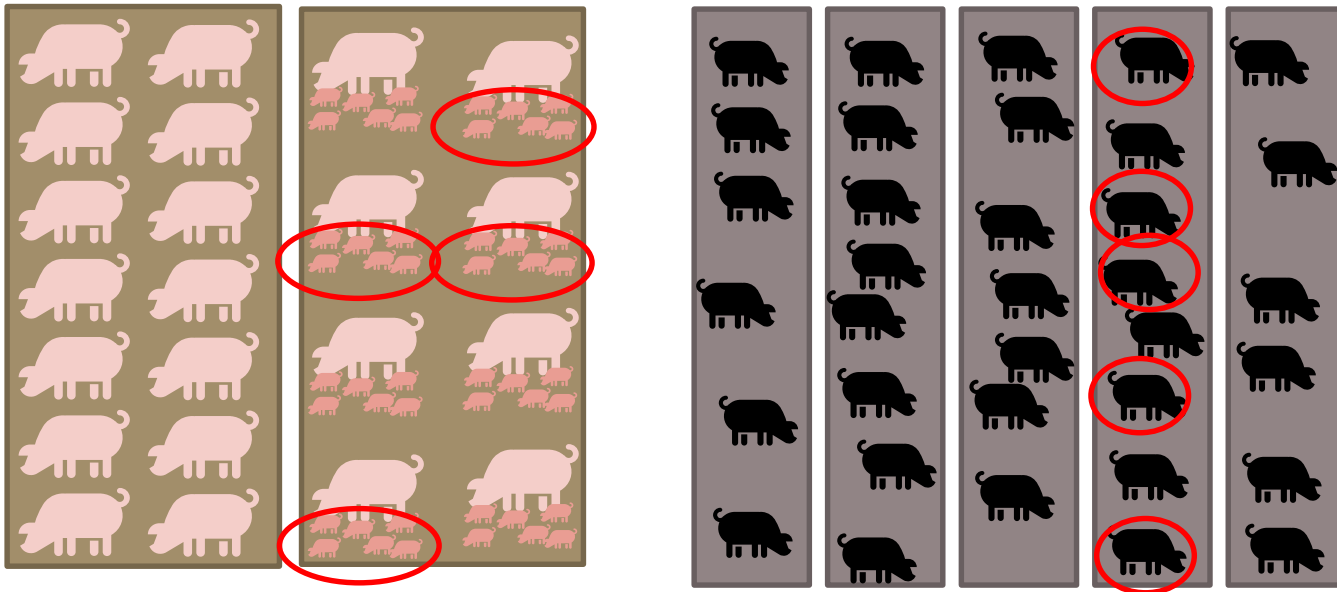
Confidence level: 95%

(Samples from 30 animals
3 from each room with 50 slaughter pigs,

with a 90% sensitive test - PCR on 5 pooled samples)

Example scenario #4

F2F site, with different buildings and rooms. Unit with 300 breeding stock ready for transfer, and 500 finishers ready for slaughter



30 blood samples from breeding stock before transfer to other site,
30 samples from slaughter pigs (all from same room)

What information do you get?

Detection level: 7-10% in each room sampled

Confidence level: 95%

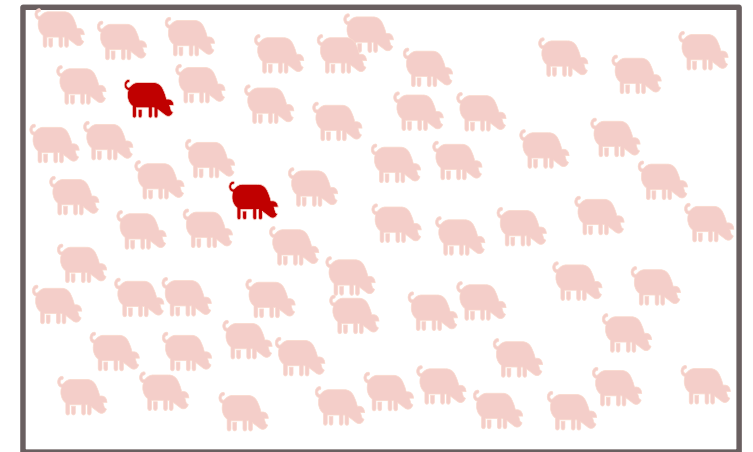
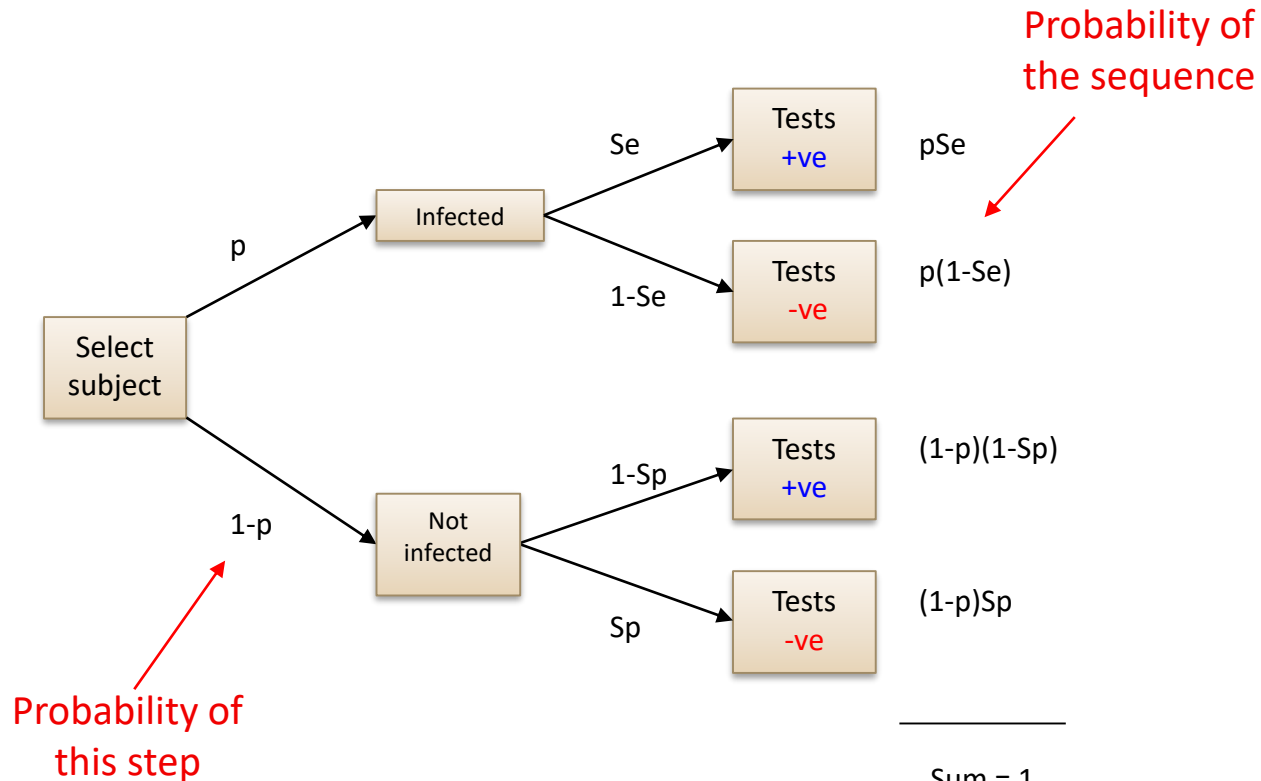
(Samples from 30 animals
from one room with ≥ 50 pigs,

with a 90% sensitive test - PCR on 5 pooled
samples)

Also: sampling from breeding stock important
to detect ASF before potential spread to other
rooms/buildings/sites

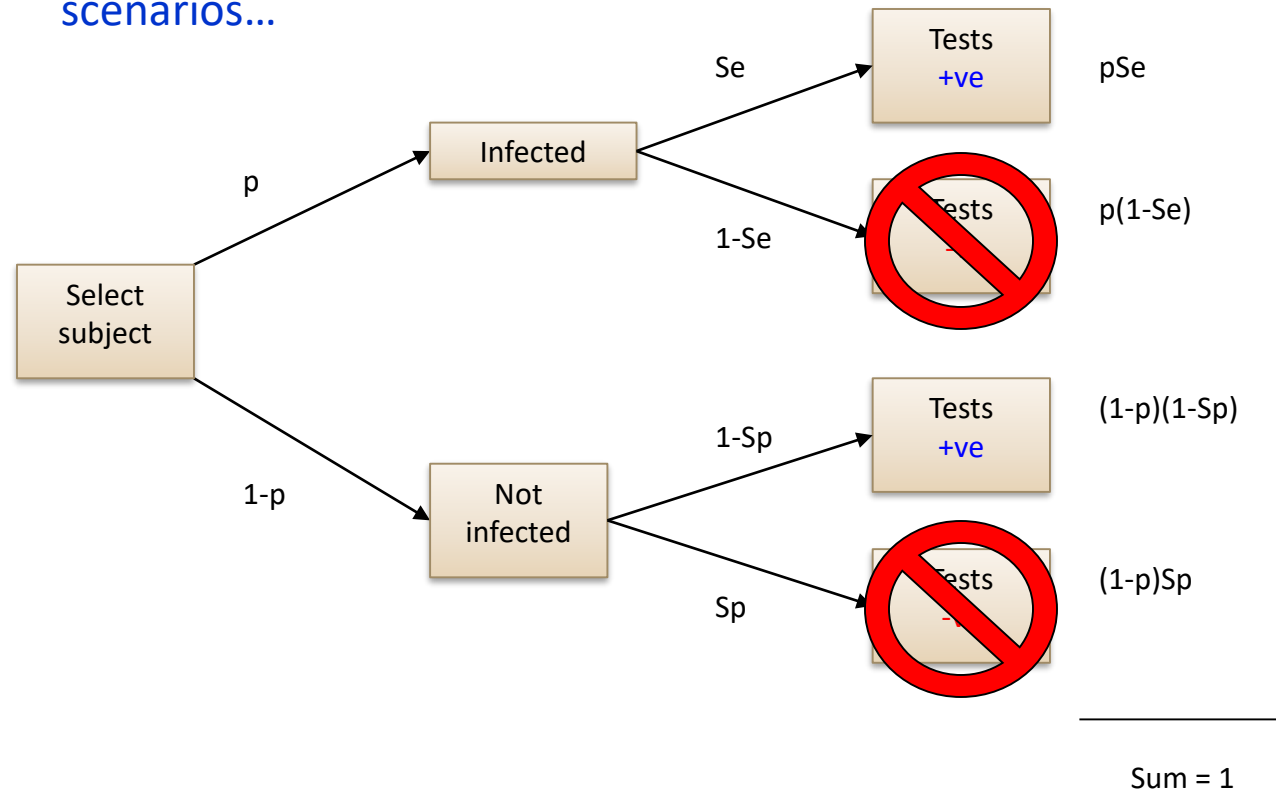
Example scenario: interpretation of test results

- Objective: Introduce concepts for **webinar #2**
- If the sample from an animal tests positive with OIE PCR, is the animal truly infected?



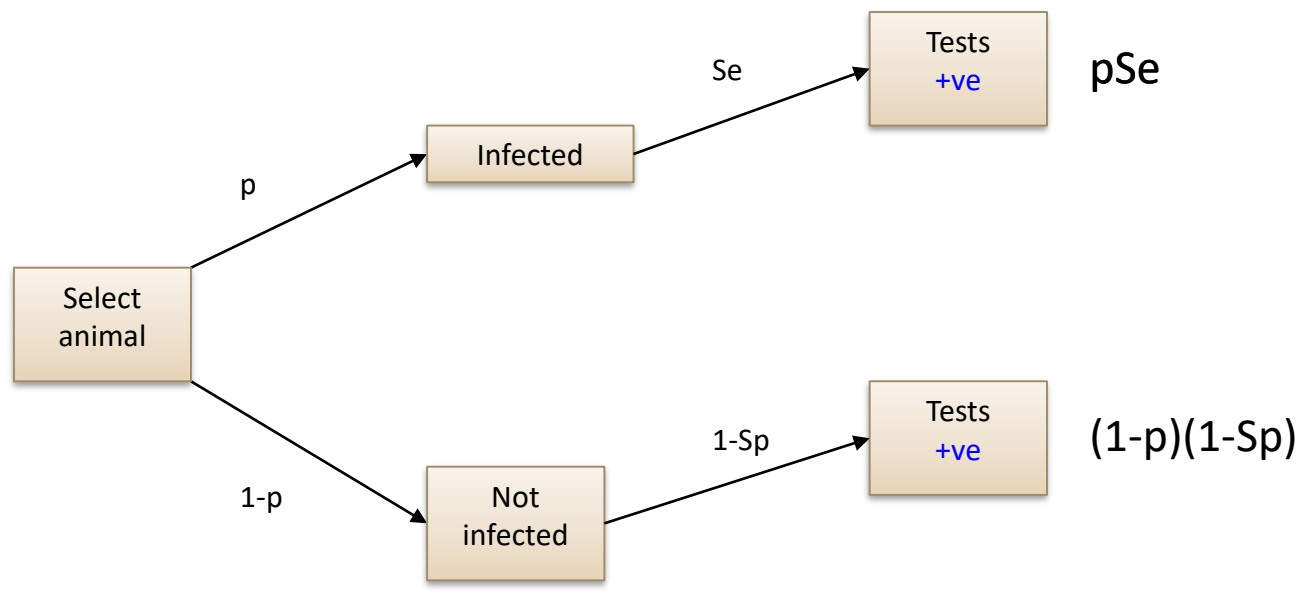
Question: if the test is positive, what is the probability that the subject was infected?

We can eliminate some scenarios...



The answer is just the ratio of the probability of the event we are interested in to the sum of the probabilities of all possible events...

...which is known as Bayesian revision

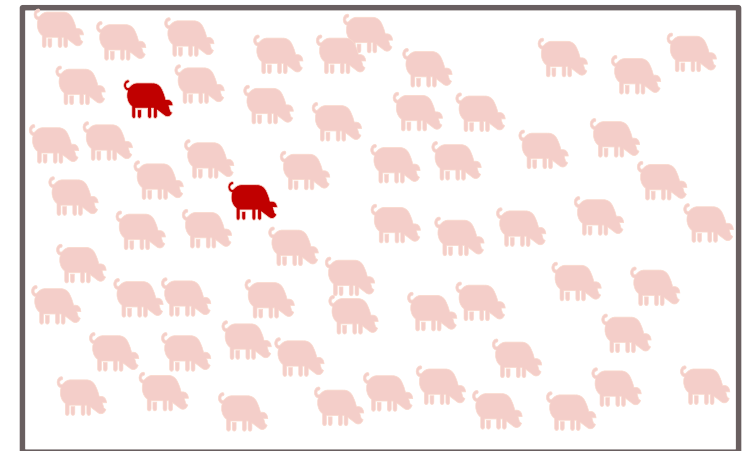


$$P(\text{infected} \mid \text{+ve test}) = \frac{pSe}{pSe + (1-p)(1-Sp)}$$

Example scenario: interpretation of test results

- If the sample from an animal tests positive, is the animal truly infected?
 - The 'predictive value' of a test depends on the test performance and the disease prevalence
 - E.g. with OIE-recommended PCR (Se: 98.5%, Sp: 97.3%), the PPV with $p=1\%$ is $\approx 27\%$, but $\approx 80\%$ with $p=10\%$
 - The more samples/tests you have, the more information you get on the true status

More details on ASF diagnostic tests,
Performance and interpretation in **Webinar #2...**



Next webinars

Preliminary program:

Diagnostic tests:

- Test performance measures (Sensitivity, Specificity, Predictive value) and how they affect test interpretation in practice
- ASF diagnostic tests available, and how to select tests for your needs
- Examples & discussion

On-farm surveillance:

- Early detection vs disease freedom
- How many samples do I need to take to be confident in the results?
- Sampling scenarios for discussion

Additional on-farm surveillance:

- Optimizing testing strategy (example scenarios)
- Understanding the value of additional samples and/or tests (e.g. ELISA, pen-side tests, etc.)
- Clinical monitoring and other non-test 'tools' to monitor ASF on my farm

[Please use this hyperlink to submit questions](#) on this webinar or the next ones

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