



Principles of passive surveillance

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Aim of surveillance

Early detection of a specific animal diseases
Has the infection been introduced?

Define the evolution of the infection
Is the infection increasing in the population or fading out?

Assess if the applied strategy works as expected
Is the applied control/eradication strategy working?

Broad “official” definitions

Disease surveillance in animal health is the **on-going** systematic collection, analysis and interpretation of data and the **dissemination of information to those who need to know** *in order to take action*

Monitoring may share common features with surveillance programs with the main difference being that monitoring activities do not require a pre-specified action to be taken *although significant changes are likely to lead action*

Surveys usually directed to identify a specific problem (for instance a preliminary survey carried out to have an estimate of prevalence before implementing a surveillance system for a specific disease) and surveys are usually limited in time. Surveys may be one component of a surveillance system as a whole

Surveillance in practice

Surveillance: to develop a strategy that **maximize the cost benefit ratio**

Highest probability **to detect** the introduction of emergent or -re-emergent infection in a free area (early detection);

Highest precision **in measuring** epidemiological parameters (i.e. prevalence, n. of seropositive animals etc.);

Sustainable from both **implementation and economical** terms;

Have a **practical approach** (actions are foreseen)

Passive (reactive)

The SUSPECT CASE DEFINITION is defined and well known among stakeholders;

Stakeholders report to Veterinary Service the SPECIFIC PROBLEM related to the Suspect case definition

The animals that belong to the "**Suspect case definition**" is tested

Animal owners report a suspect case to the Vets

Active (proactive)

The Veterinarians directly collect animal health data using a defined protocol that has been decided in advance (sampling, tests etc.)

A population or a part of it (risk based) is actively investigated to detect an infection

Vets, go in the farm and take samples, check the animals

Vets known what they are looking for..

High Risk Periods

FIRST

The period between the introduction of an infection into a Country and the first detection of the infection

How much time we need to detect the infection?

How much the infection was present before to be detected?

The length of the 1st HRP depends on: the efficacy and efficiency of the surveillance scheme in place

Surveillance strategy

SECOND

The period between the first animal has been detected as infected and the establishment of measures to prevent virus spreading

How much time we need to put in place control measures ?

Outbreak management

HRPs duration

The success of a disease control policy is related to the capacity to limit the spread of the infection during the two High Risk Periods of an epidemic:

Rapid identification of the virus (agent): early detection

Increased bio-security and hygienic standards: prevention of new cases

Prompt enforcement of appropriate control measures (reduction of the wild boar population)

Passive or active: which is better?

Passive is better when

An official “suspect case” definition is available and well known among stakeholders

Evident Clinical Symptoms

High lethality rate

High animal owners awareness

High Veterinary Service awareness

Active is better when

Clinical symptoms are not evident, episodic or short lasting

Low/null lethality rate

Low animal owners awareness

Which animals have to be tested ?

The suspect case definition

1. Does not define the clinical signs of the infection we are interested on;
2. Does not define the population at risk;
3. It defines which are the **characteristics of the animals that will be actively selected** by the surveillance program (investigated, inspected, tested etc.)

BROAD suspect case definition

BROAD DEFINITION: means that we define of interest ANY ANIMAL THAT COULD be infected, even if the shown clinical signs are not totally overlapping the typical signs of the infection we are dealing on;

*All the sick animals in any farm **independently from their clinical signs***

BROAD DEFINITION: implies that a large number of animals will be tested/investigated; high number of negative test; higher costs; **increased probability to early detect the infection**

NARROW suspect case definition

NARROW DEFINITION: means that we define of interest ANY ANIMAL showing clinical signs overlapping the main characteristics of the disease we are dealing on;

Any animals showing fever (>40°C) inappetence, diarrhoea, pneumonia, cyanotic skin, pneumonia etc.

NARROW DEFINITION: implies that a relatively limited number of animals will be tested/investigated; all tested animals hav a high probability to be infected; Low number of negative test; Reduced costs; **Reduced probability to early detect the infection**

Detection of ASF in wild boar using two suspect case definitions

- A) All individuals found dead => broad suspect case definition
- B) All individuals shot showing clinical sign of the diseases => narrow suspect case definition

Expected number of cases?

Do we expect the same number of investigated cases?

Do we expect the same number of positive cases?

A) **A BROAD SUSPECT CASE DEFINITION:** high sensitivity of the surveillance system, but too many laboratory investigations, material for field sampling, travels to the lab etc.

C) **A NARROW SUSPECT CASE DEFINITION:** low surveillance sensitivity since wild boars that could show clinical signs are unlikely to be sighted

Broad or narrow suspect case definition ? RISK ASSESSMENT

BOARD CASE DEFINITION: to be used in high risk areas; we test EVERY animal that could be infected

Narrow case definition: to be used in a very low risk areas; we test ONLY animals that show the typical signs of the disease; we are not afraid to receive the infection;

Efficiency of a surveillance system

The efficiency a surveillance system is modulated according to the characteristics of:

Disease: lethality, spread, clinical signs

Susceptible host population: species, geographical distribution, size, breeding system; biosecurity etc.

and

Risk of introduction/persistence: risk assessment

Passive surveillance in wildlife

Role played by wildlife in the epidemiology of infection: reservoir, spill over...*the wild boar population is epidemiological reservoir of ASF virus;*

Area of interest: the area that has been identified at risk and that contains a wildlife metapopulation that lives in a continuous geographic distribution delimited by natural or artificial barriers

Suspect case definition: rarely clinical signs are seen, death is the obvious symptom (low lethal diseases)

Efficacy of the passive surveillance: difficult to assess: how many dead individuals are retrieved in peace time?

Sample collection: how to collect sample? Hunters, zoologists

Efficacy of the passive surveillance

No dead wild boar reported does not mean that wild boar do not die
It means that nobody reports them and thus the passive surveillance is
not working;

At present there are no magic recipes

Form the experience gained in infected countries it appears that, in FREE
AREAS

0,5-1% of the estimated wild boar population is found dead each year
without any infection

Wild boar natural mortality is about 10% (excluding hunting)

The goal would be to find 10% of them

1% of the whole alive population

Passive surveillance: critical points I

Suspect case definition:

broad definition will increase the sensibility of the surveillance (many false positive cases) whereas narrow definition will reduce the number of false positive cases but might enhance the number false negative cases and thus leaving undetected for some time the infection in the area.

The suspect case definition could be adjusted according to the (perceived or assessed) risk of the area.

Low risk areas => narrow case definition (**possibly undetected positive cases**)

High risk areas => broader case definition (many negative animals investigated but **high probability to early detect the virus**)

Passive surveillance: critical points II

Communication chain: passive surveillance is based on reporting, hence a person willing to report must know to whom to report and how (green lines, mobile of a responsible person, avoid reporting to “Veterinary Service”)

To whom it should be reported the finding of a dead wild boar in the forest?

Awareness and acceptance: is the most important step of any passive surveillance. I.e. nobody will report what is unknown, or a disease for which a stamp out policy without compensation will be applied.

The detection of ASF in wild boars poses several restriction when hunting: are hunters willing to participate?

Passive surveillance: critical points III

Evaluation of the passive surveillance efficiency: no reports does not mean no cases; the number of suspected cases to be investigated has to be estimated in advance, same figures should be used to evaluate the efficacy of the surveillance in place;

In peace time, how many dead wild boars should be found in at risk areas?

Duration: it is always difficult to maintain an high level of passive surveillance for any disease absents for a long period in an area or totally unexpected.

When France, Hungary, UK should put in place a efficient surveillance system for the early detection of ASF in wild boars and how long it should run?

ASF surveillance in wild boar

Field example

Aim:

- a) Early detection
- b) evolution of the infection

Suspect case definition and ASF detection

Broader case definition: all found dead animals: N. 227

178 detected cases (78,4%)

49 negative investigations

First case detected 25/07/2014

Narrow case definition: animals shot while showing clinical signs: N. 1

1 detected case (100%)

No negative investigations

Lost 178 cases

Case detected 20/08/2014

Early detection of ASF in wild boars Passive surveillance vs. active surveillance

LATVIA: Summary of wild boar data (June-December, 2014) within the infected areas (Part II and Part III)

	Number of tested animals	Number of positive results
WB found dead	227	178
WB hunted	2733	39

Efficiency of passive vs active surveillance: field data

Virus detection in dead animals: $178/227 = 0,78$

Virus detection in shot animals: $39/2733 = 0,014$

detection in dead/detection in shot

$0,78/0,014 = 55,7$

The probability to detected a virus in dead animals is 55 times higher than in shot animals

$(55/(55+1))*100 = 98\%$

98 out of 100 are likely to be detected in **dead** wild boars

Detection probabilities of ASF Virus in a wild boar population: simulated population Prev=2%, Lethality 90%

Ratio and probability between rates

			ratio	detection probability %=ratio/(ratio+1)
Lethality rate	vs	Hunting rate	8675	99.99
Virus positive Found dead (100%)	vs	Virus positive hunted	174	99.4
Virus positive found dead (10%)	vs	Virus positive hunted	17,4	94.6
Virus positive found dead (10%)	vs	Sero-positive hunted	348	99.7

ASF prevalence estimation

Found dead animals = 78%
Shot animals = 1,4%

Which is the true period prevalence?

Is prevalence revealed by active or passive surveillance?
Which kind of data could be compared among different countries?

Take at home message

Surveillance is a strategy shaped by appropriate techniques

Passive surveillance:

Irreplaceable in the early detection of almost all infectious diseases and in particular for ASF in wild boars;

The suspect case definition is relatively easy to develop

The minimum number of animals that have to be tested must be planned and reached **≈ 1% of the whole alive wild boar population** at risk;



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