Emergency preparedness and response to an outbreak of PPR

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EU Reference laboratory for Peste des Petits Ruminants

Funded by the European Union

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WOAH
Reference Laboratory Network for PPR

WOAH Reference Laboratory for peste des petits ruminants

Reference Centre

World Organisation for Animal Health
Founded as OIE

Are we ready?

Contingency planning

"Contingency planning" *= modelling probable emergency disease situations and on the basis of this to plan and rehearse the optimal response mechanisms to the emergency that will allow the disease to be controlled and eradicated in the most rapid and cost-effective way*

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Are we ready?

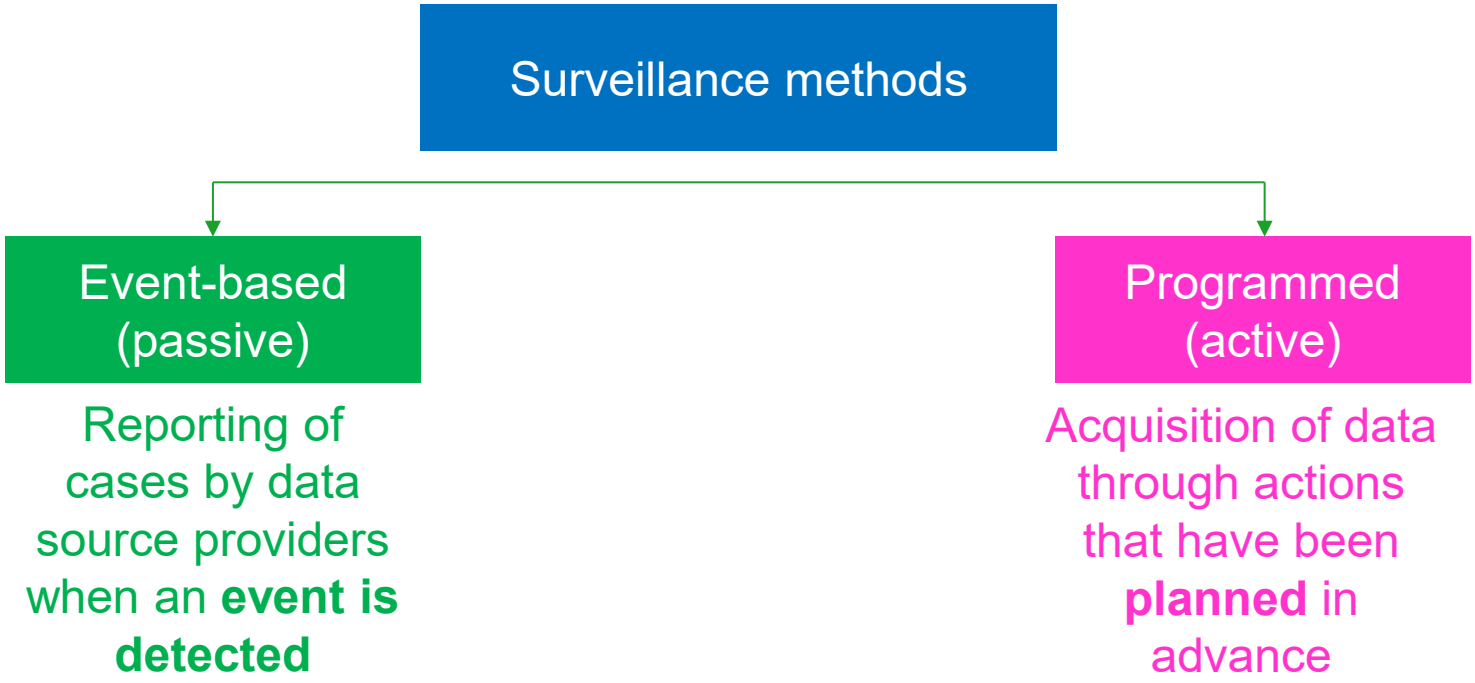
Contingency planning

- Pre-epidemic
- Epidemic
- Post-epidemic period

The challenge in CP relates in particular to decision making in the pre-epidemic period.

Pre-epidemic → Epidemic → Post-epidemic period

Pre-epidemic: surveillance for early detection



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Pre-epidemic: surveillance for early detection

Surveillance methods

Event-based (passive)

- Spontaneous reporting of suspected cases (herds, abattoirs, markets, parks, border inspection posts) that need be then confirmed
- Adapted to **early warning** and detection of rare events, but low-specificity and inefficient to detect sub-clinic cases
- Efficient if effective reporting by all field actors (farmers, CAHWs, paravets, private vets, field agents in slaughterhouses, parks, etc.)

Pre-epidemic: surveillance for early detection

Early warning strengthened by:

- Raising awareness of livestock keepers on PPR & the importance of reporting suspected cases
- Training field vets in PPR disease identification and investigation

MINISTÈRE DE L'AGRICULTURE ET DE LA SOUVERAINETÉ ALIMENTAIRE

VIGILANCE PESTE DES PETITS RUMINANTS

SIGNES CLINIQUES
(PAS SYSTEMATIQUEMENT PRESENTS)

- Forte fièvre (jusqu'à 41°C)
- Perte d'appétit, léthargie
- Écoulement nasal, larmoiement
- Lésions érosives dans la bouche, la langue peut être recouverte d'un dépôt blanchâtre
- Toux sèche, difficulté à respirer
- Diarrhée parfois avec du sang

Quelques jours après l'apparition des symptômes, les animaux peuvent mourir.

© FAO

La **peste des petits ruminants** (**PPR**) est une **maladie virale** grave qui ne touche pas l'homme mais touche les petits ruminants comme les moutons et les chèvres. Il n'y a **pas de traitement spécifique** contre cette maladie. L'usage des **antibiotiques** pour traiter les infections bactériennes secondaires peut **réduire les signes cliniques apparents** et **augmenter les risques de transmission silencieuse**.

La maladie se transmet par **contact direct avec des animaux malades**. La **mortalité** chez les animaux infectés peut atteindre **70 %**.

Elle est endémique au Moyen-Orient et en Afrique. Depuis juillet 2024, la maladie a été détectée en **Grèce**, en **Roumanie**, en **Bulgarie** et en **Hongrie**.

N'introduisez pas dans votre élevage des animaux dont le statut sanitaire n'est pas vérifié

SI VOUS CONSTATEZ CES SIGNES CLINIQUES

CONTACTEZ SANS DÉLAI VOTRE VÉTÉRINAIRE

Leaflet on PPR distributed by Minister of agriculture in France

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Pre-epidemic: surveillance for early detection

Surveillance methods

Programmed (active)

- Two main types:
  - Conventional surveillance: focus on the whole population of interest
  - Risk-based surveillance: focus on the population more likely to be infected (robust prior risk assessment study)

- Two investigation approaches:
  - Exhaustive : the entire target population is sampled

    Costly, only in specific eradication context
  - Sampling : a sub-set of the population
    - Random sampling
    - Targeted sampling
    - Sentinel

Pre-epidemic: surveillance for early detection

Surveillance methods

Programmed (active)

Random sampling:

- A representative sample of the population
- To follow trends or to prove freedom (prevalence)
- Detection of sub-clinic cases but inefficient for early warning

Sentinel:

- Repeated collection of samples in specific herds or individuals
- For early warning (incidence)
- Costly surveillance – issue with animal mobility

Targeted:

- Sample targeted to herds/individuals with a higher risk of infection or of being infected (farms with no biosecurity, etc.)
- Increasing the level of detection
- No extrapolation to the entire population

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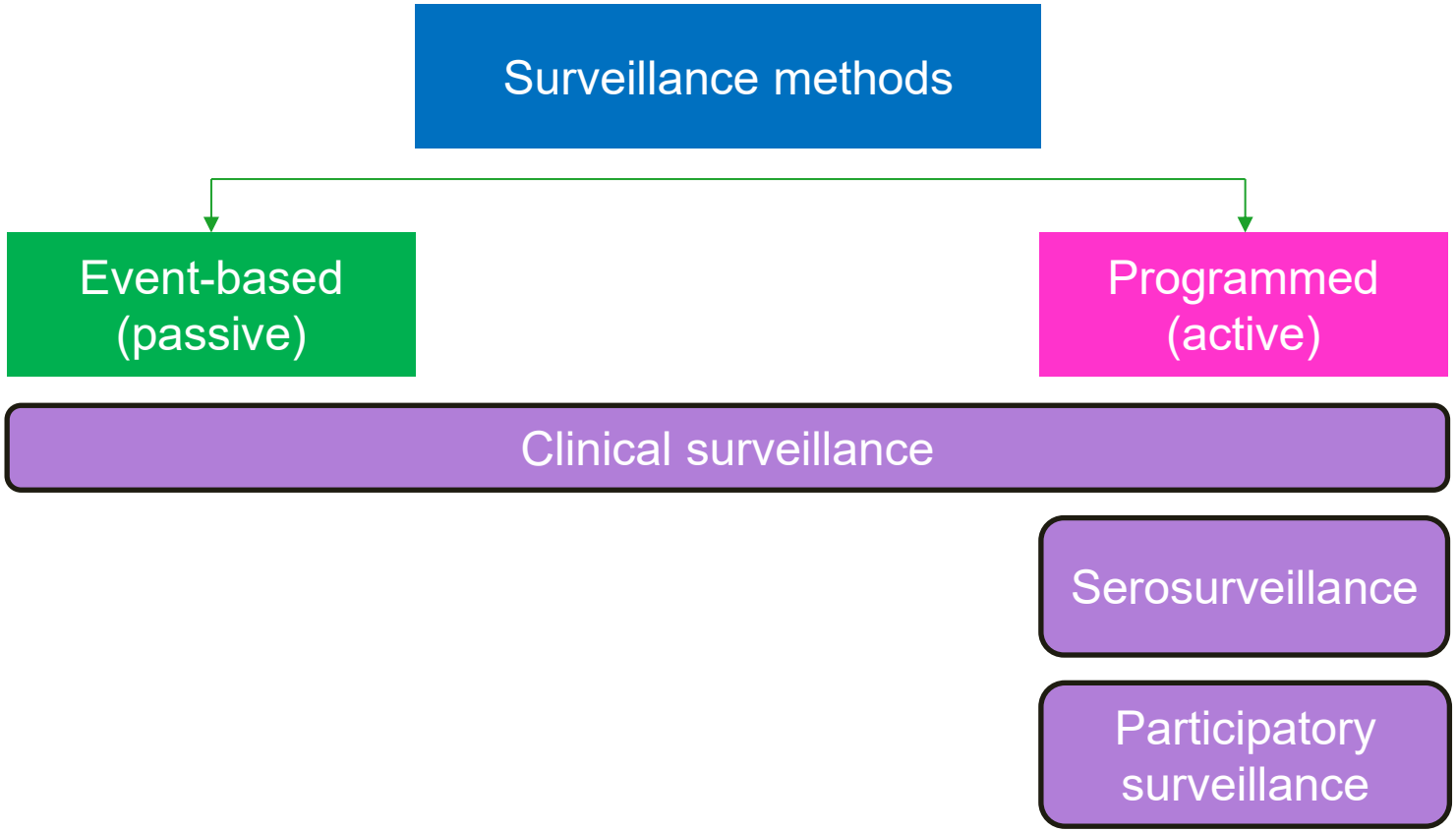
Pre-epidemic: surveillance for early detection

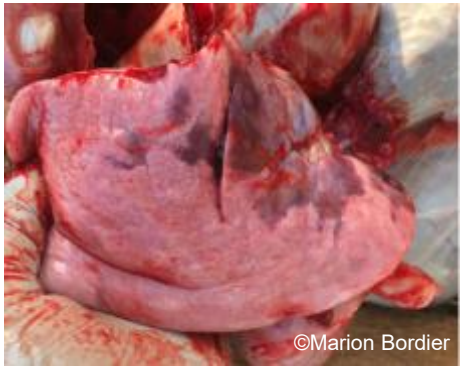
Measurement methods



Clinical surveillance

- Principles:
  - Detection of clinical signs or lesions of PPR by close physical examination or post mortem examination of animals
  - Sample collection for serology and virology, if suspect cases detected and according to the case definition
  - Interviews with relevant stakeholders about recent or current health issues, unusual mortality of other events, vaccination history, etc.

- Populations targeted:
  - **Small ruminants herds**: main host for PPR
  - Domestic suids: in free-ranging herds, mixing with small ruminants
  - Wildlife: in threaten species susceptible to PPR (for biodiversity preservation concern) and in species presenting a proven risk for introduction and spread of the virus



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Clinical surveillance

PPR clinical signs

- high mortality
- fever – depression
- ocular discharge – watery, becoming purulent, matting of eyelids, conjunctivitis
- nasal discharge – watering, becoming mucoid and purulent, blocked nostrils
- coughing, sneezing, broncho-pneumonia
- mouth lesions – ulcers, necrotic tissue, sores on lips, discharge around mouth
- sores and nodular lesions around muzzle
- diarrhoea – watery, dysentery, dehydration
- abortion

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1-2 year old goat with mucoid nasal discharge and diarrhoea
Source: B Jones

Clinical surveillance

Field diagnosis can be complex because:

- The severity of the disease varies with species, breed, as well as the animal's immunity to PPRV
- Sheep and goat are not always affected to the same extent during an outbreak.

- **Symptoms are often confused** with, and exacerbated by, secondary infections making PPR a difficult disease to characterise and diagnose (CCPP, BTV, pasteurellosis…)

Clinical surveillance

Possible case definition – Pneumo-enteritis syndrome

An pneumo-enteritis outbreak is characterised as a number of cases in a flock (exceptionally a single animal) in which at least one of the following clinical signs are present:

- Bilateral, clear or purulent ocular and nasal discharges
- Fever, coughing and sneezing

AND may be accompanied by one of the following:

- Conjunctivitis
- Difficulty breathing (dyspnoea)
- Erosions (ulcers) in the epithelium of the mouth +/- cheese-like coating on the epithelium
- Diarrhoea or dysentery
- Death

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BUT if strong epidemiological suspicion/risk but no symptoms or unexplained mortality: take samples anyway to rule out PPR

Confirmation of field diagnosis

Use of point of care tests

- Diagnostic tests: **Antigenic rapid test**
- Sample types: **Nasal and ocular swab** (+/- oral and rectal swab) on animals with fever and early clinical signs
- High specificity, medium sensitivity (70%)

- Recommendations for use:
  - Test up to 5 or 10 animals , stop as soon as you have a positive.
  - If positive: take a set of samples from 2-3 animals for laboratory analyses
  - If negative but strong suspicion: take a set of samples from 5-6 animals with early signs for laboratory confirmation of negativity

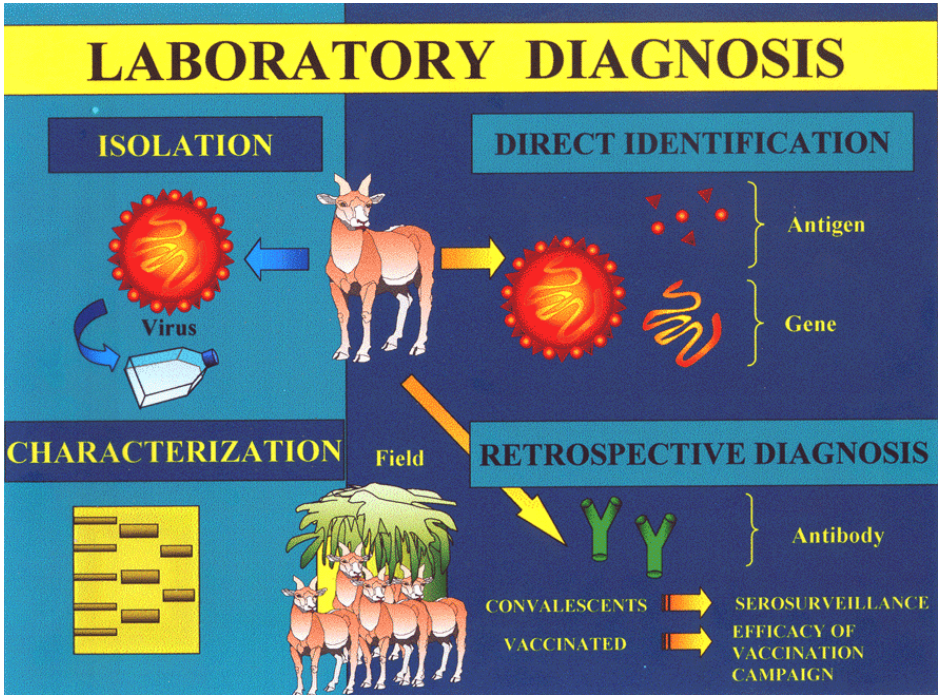
Interpretation: A positive test is enough to take some control measures (quarantine, ban of movement, etc.) without waiting for lab

Laboratory diagnosis of PPR

- Establishing diagnosis to complete observations of clinical symptoms- compulsory for disease confirmation
- Implementing quality diagnosis with standardised methods to deliver reliable PPR diagnosis results
- Different type of tests for different purposes

For latest VALIDATED protocols, see WOAH/FAO ref labs:

https://www.ppr-labs-oie-network.org/



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Laboratory diagnosis of PPR

Importance of sample container and storage

Type of sample	Container	Preservation medium
Swab	Viscose swab in original tube (avoid cotton swab)	No, except if no ice available
Whole blood	Blood collection tube	EDTA
Tissues from internal organs	Plastic tube with screw-cap	No, except if no ice available
Serum	Blood collection tube	No

Site	Type of sample	Storage condition	Length of storage	Packaging
From field to lab	All	On ice	<24hr	Double packaging
National lab	All	5 ± 3°C	<3 days	Double packaging
National lab	Swabs, tissues, buffy coat	≤ -65°C	No limit	Double packaging
National lab	Serum	≤ -16°C	No limit	Simple packaging

All validated protocols available at https://www.ppr-labs-oie-network.org/

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Epidemic - Outbreak reporting and investigation

Reporting channels?

- Who is likely to report?
- Where do they report?
- Who will take action?

Preparedness for outbreak investigation

- Transport, communications
- Team members
- Clinical, sampling and post mortem kit
- Cold chain
- PPE & disinfection
- Camera, GPS
- Record-keeping

Adult sheep with profuse mucoid nasal discharge
Source: B Jones

Epidemic - Outbreak reporting and investigation

The main activities are:

- history-taking
- clinical examination
- post mortem examination
- back- and forward tracing
- sample collection
- record-keeping

Adult sheep with profuse mucoid nasal discharge
Source: B Jones

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Epidemic - Outbreak reporting and investigation

History taking

- when did the disease start?
- Has it been observed before?
- what clinical signs have been observed?
- what species, ages are affected?
  - how many are sick?
  - how many have died?
  - total flock size
- has any treatment been applied?
- what vaccinations has the flock received?
- production system
- Any other species in the area?
  - Same issue seen in other animals in the market, pasture….
  - any sick or dead wildlife, suids etc…?

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Outbreak reporting and investigation

General examination of whole flock

- body condition
- main clinical signs
- species, ages affected

Clinical examination – several sick animals with range of signs

- mild and severe
- early and later cases

Observe:

- body condition and behaviour
- eyes
- nose
- mouth – gums, tongue, hard palate
- breathing (respiratory rate)
- hindquarters – diarrhoea?
- body temperature
- feet (for differential diagnosis)

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Outbreak reporting and investigation

Post mortem examination

- External signs
  - Eyes
  - Nose
  - mouth
  - Diarrhoea
  - Feet
- Thoracic cavity
  - Lungs
  - Lymph nodes
- Abdominal cavity
  - Gastro-intestinal tract
  - Lymph nodes
- Mouth and pharynx

Post mortem; congested and collapsed areas of lung, zebra striping of large intestine.
Source: B Jones

Epidemic - Outbreak reporting and investigation

Tracing window = date of onset of first case
+ maximum incubation period (sometimes go back one month)

Collect data on:

- sheep and goat movements on and off farm
- all contact with other flocks

Movements on to the farm:

- bought – from where?
- Moved from another location – where?
- Other animals joining the flock?
- Movement of equipment/persons?

Movements off the farm:

- Sold – where?
- Moved to another location – where?
- Other animals leaving the flock?
- Movement of equipment/persons?

Contact with other flocks: At pasture, watering points…

Opportunities for contact with other flocks: watering points, livestock markets
Source: B Jones

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Biosecurity measures

- Risk for disease transmission may be associated with personnel especially during surveillance and farm visits.
- Biosecurity is a set of practices designed to prevent the spread of the disease-causing agent.
- It is vital that disease investigators lead by example by observing biosecurity procedures because it will be difficult then to persuade other staffs and farm visitors.
- Farmers and field vets should be aware of biosecurity measures needed to protect flocks


Disinfectant Foot Dip


"dirty" areas

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Biosecurity measures

During PPR investigations sampling and epidemiological information collated while maintaining biosecurity:

- Wear disposal personal protective equipment (PPE), gloves, overboots etc..
- Carry out cleansing and disinfection before and after visiting any farm
- Strict segregation between “dirty” and “clean” area are essential
- Quarantine period for the persons entering the dirty area should be observed (at least 5 days for PPRV).
- Containers, vehicles coming from the dirty area where the clinical team is, should be decontaminated before exiting this area….


Disinfectant Foot Dip


“dirty” areas

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Control measures

With limited number of outbreaks in a restricted area– Movement restriction and stamping out are efficient measures

Lifting restrictions

Restocking

Notification of the outbreak

Stamping out

Destruction /treatment of all substance or waste that may have been contaminated (e.g. feed, manure etc.) to ensure destruction of the disease agent

Cleaning and disinfection of all buildings, surroundings, equipment

Epidemiological inquiry

Extension of measures in holdings suspect of contamination

Zoning

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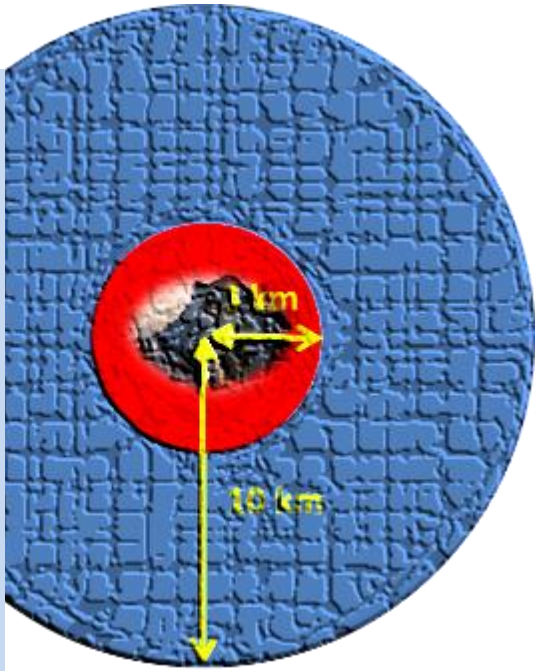
Control measures

Protection zone

- Identification of holdings with susceptible species
- Periodic visits
- **No Movement** and transport of susceptible animals on public-private roads (only service roads of holdings + derogations for transiting)
- No exit of animals from the holdings unless to slaughterhouse for emergency slaughter under conditions (clinical examination/notification)

Surveillance zone

- Identification of holdings with susceptible species
- Period visits
- **No movement** and transport of susceptible animals in public/private roads (only for pasture or animal buildings + derogations for transiting)
- Transport of animals subject to authorization
- No exit of animals from the zone for 1 max disease incubation from the most recent recorded case- then exit to slaughterhouse under conditions (clinical examination /notification)



Importance of communication with stakeholders

Valuation of animals

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Control measures - vaccination

If PPR incursion cannot be controlled by stamping out, movement restrictions etc…: Vaccination could be an alternative

Vaccination may have important commercial impact, with prolonged time required to restore PPR-free status

Live, attenuated homologous vaccines available

- Most used strain: Nigeria 75/1 (Master seed held by CIRAD)
- Efficacy, innocuity, long-term, no residual side effects
- Cheap to produce, scalable for mass production
- Lyophilized for stability, but to be used within few hours when resuspended
- Multiple producers outside of EU
- External QC control is essential (by AU-PANVAC, WOAH ref lab, etc…)

Control measures - vaccination

Multiple **vaccination strategies** possible depending on context and ressources:

- Blanket vaccination of all suesceptible animals in an areas
- Ring vaccination around an outbreak
- Targeted vaccination, e.g. based on risk assessments
- Barrier vaccination to prevent spread in a new zone/country

Post-vaccination evaluation is paramount to assess efficacy of the vaccination

Serosurveillance and early warning efforts need to be well designed to proof eradication and freedom from PPR

In summary

A strong contingency plan should include:

- A strong early warning system based on the reporting of suspected cases by livestock keeper and frontline animal health actors (CAHWs, paravets, vets)
- Prompt investigation of all suspected PPR cases
- Programmed surveillance in high risk areas
- Procedures for implementing appropriate control and biosecurity measures, and to prove freedom from the disease

Remember! Even in a PPRV free country, suspected cases of PPR disease should occur sporadically – investigate and follow up to confirm or exclude diagnosis

Thank you

Any question or request:
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Through the website -> contact us form
http://eurl-ppr.cirad.fr
https://www.ppr-labs-oie-network.org/

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