



Food and Agriculture
Organization of the
United Nations

Detection of PPR in the field and differential diagnosis

Professor Satya Parida

Laboratory and Vaccine Specialist

FAO PPR Secretariat

satya.parida@fao.org



OUTLINE

1. PPR aetiology and transmission
 2. PPR clinical signs and post-mortem lesions
 3. Differential diagnosis
 4. Summary and conclusions
-

Peste des Petits Ruminants (PPR) is caused by an RNA virus

Order: Mononegavirales

Family: Paramyxoviridae

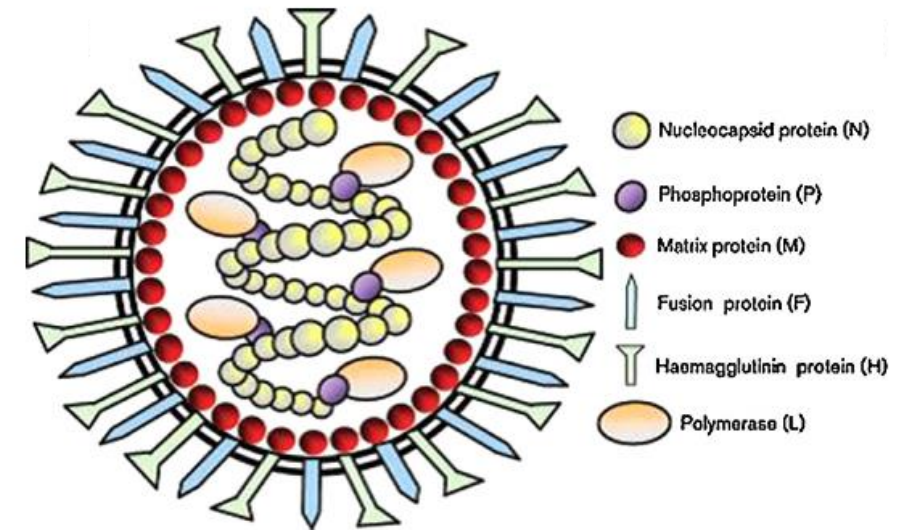
Sub-Family: Paramyxovirinae

Genus: Mobillivirus

Measles virus

Rinderpest virus

PPR virus

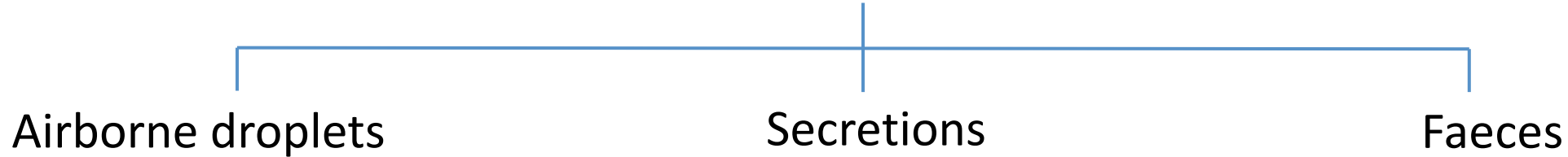


Schematic diagram of PPR virion structure
(adapted from Banyard et al., 2010)

PPR TRANSMISSION

PPR virus is highly contagious

It can be transmitted directly via:

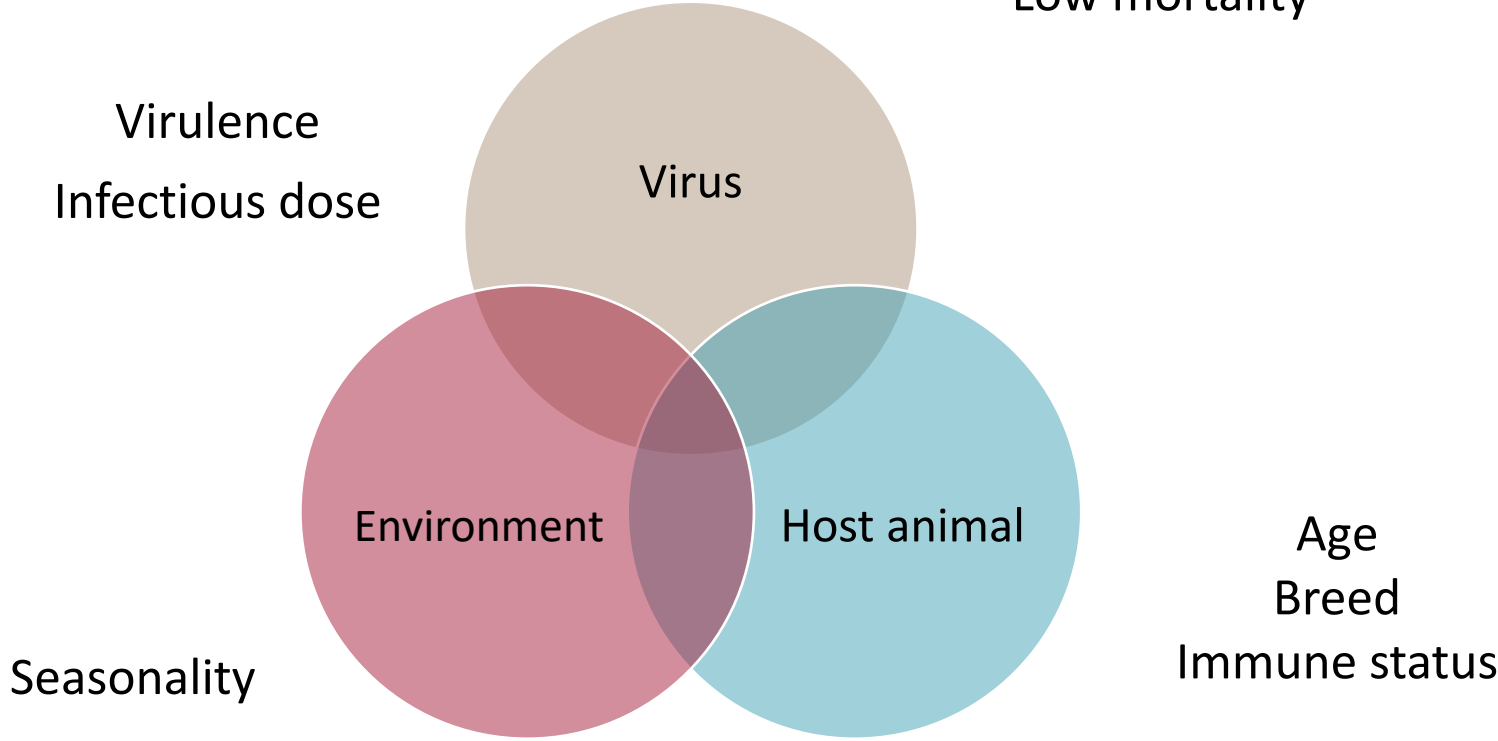
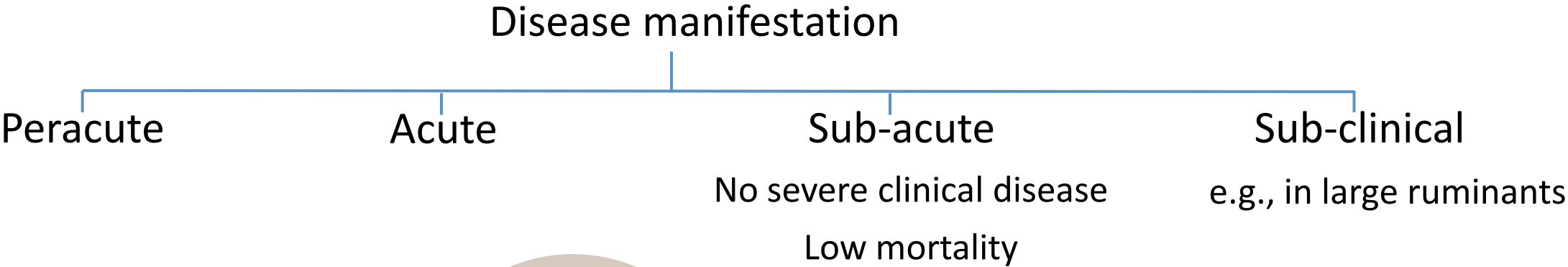


Sheep and goats are the primary hosts

Wildlife species also affected

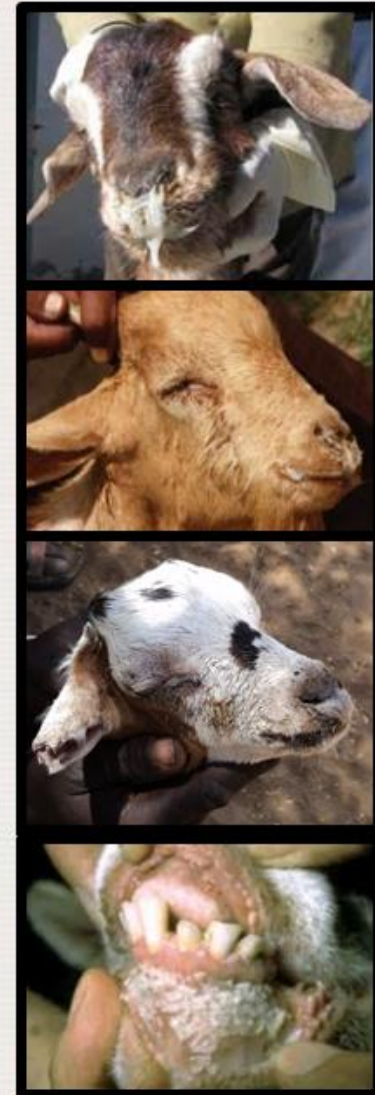
Atypical species, e.g., cattle and camels, have also been affected

PPR DISEASE MANIFESTATION



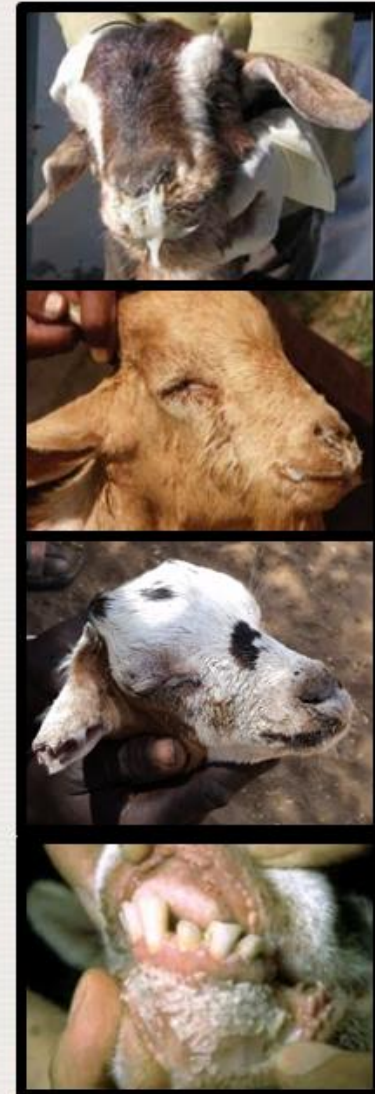
Acute form

- Sudden rise in body temperature (40–41°C) - pyrexia can last for 3–5 days
- Animals become depressed or restless, anorexic and develop a dry muzzle and dull coat
- Serous nasal discharge becoming mucopurulent and resulting, at times, in a profuse catarrhal exudate which crusts over and occludes the nostrils; signs of respiratory distress (up to 14 days)
- Within 4 days of onset of fever, gums become hyperaemic (congestion of the blood), and erosive lesions develop in the oral cavity with excessive salivation



Acute form

- necrotic stomatitis with halitosis is common
- Small areas of necrosis on the visible mucous membranes
- Congestion of conjunctiva,
- Severe, watery, blood-stained diarrhoea is common in later stages
- Bronchopneumonia evidenced by coughing is a common feature; rales and abdominal breathing
- Abortions may occur
- Dehydration, emaciation, hypothermia and death may occur within 5–10 days
- Survivors undergo long convalescence



PPR CLINICAL SIGNS (ACUTE FORM)

Incubation period of 4-6 days (3-14 days)

↓
Pyrexia (41°C)

Depression, anorexia &
muzzle dryness



↓
Congestion of conjunctiva and oro-facial mucosae (a)

↓
Ocular and nasal discharge (b)
Serous -----> Muco-purulent



↓
Appearance of lesions on dental pad, tongue, soft palate, and
nasal mucosa (c)

Increased salivation



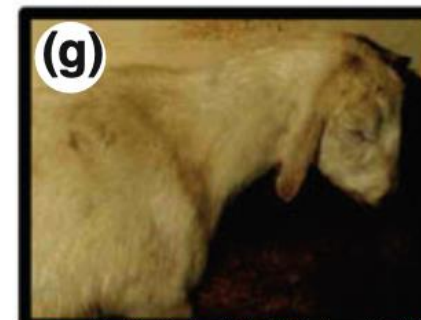
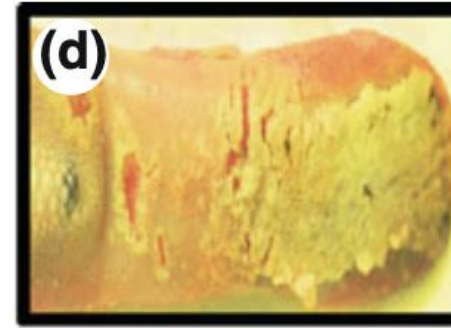
PPR CLINICAL SIGNS (ACUTE FORM) - CONTINUED

Oral lesions may become necrotic with caseous deposits on tongue **(d & e)**

Coughing
Labored breathing
Halitosis

Watery blood-stained diarrhea **(f)**

Weight loss, emaciation, and death **(g & h)**

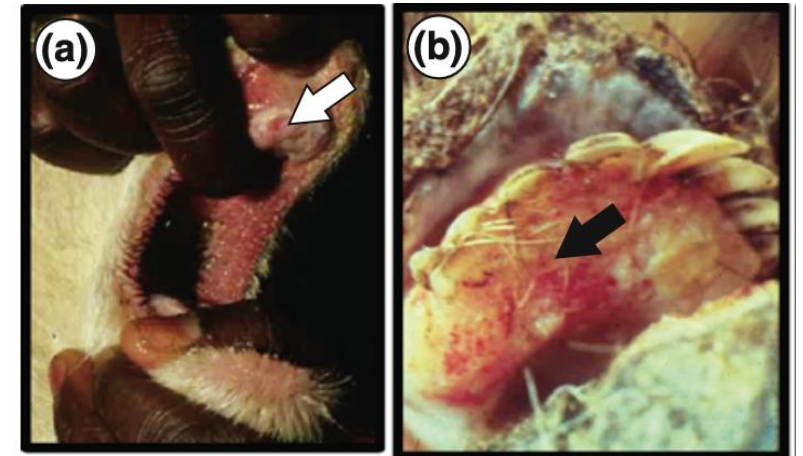


PPR POST-MORTEM LESIONS

GASTRO-INTESTINAL LESIONS

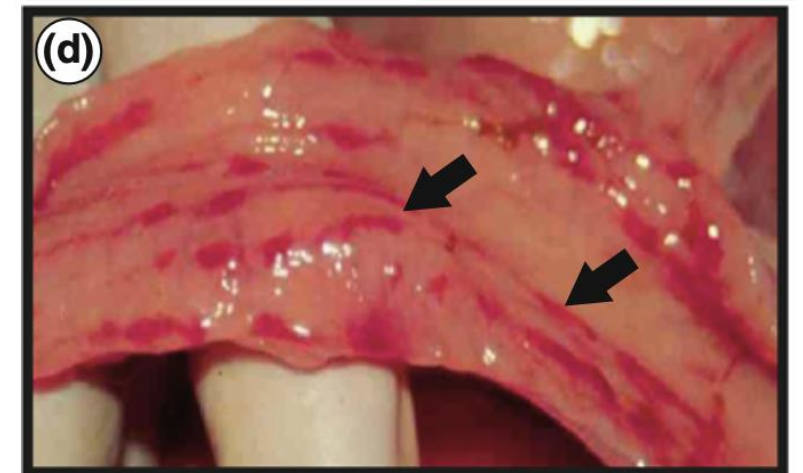
Prominent crusty scabs along outer lips

Ulcerative or necrotic lesions in the buccal cavity (a & b)



Congestion, oedema and ulceration of digestive tract mucosa – “zebra striping” (d)

Haemorrhage of ileo-caecal valve



PPR POST-MORTEM LESIONS - CONTINUED

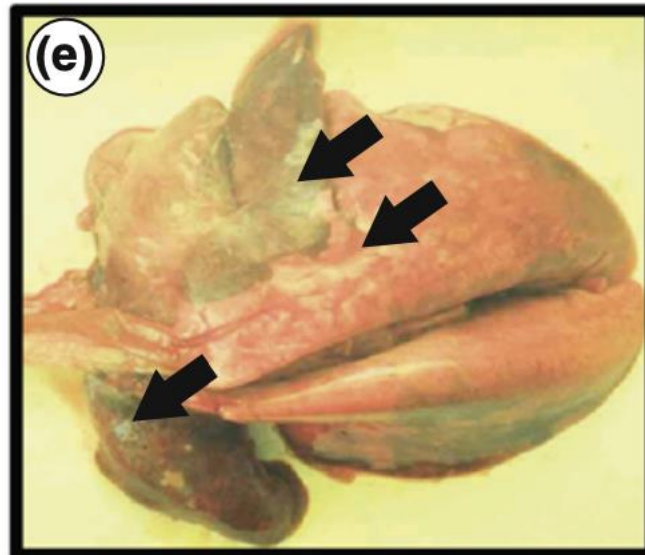
RESPIRATORY LESIONS

Hyperaemic nasal mucosa

Froth in trachea and bronchi

Pulmonary congestion, oedema and consolidation (e)

Fibrin deposits on pleura



OTHER LESIONS

Necrotic Peyer Patches

Enlarged lymph nodes

Necrotic spleen and liver

PNEUMO-ENTERITIS SYNDROME

CASE DEFINITION

Bilateral ocular and nasal discharge
(clear or purulent)

+

Fever, coughing,
and sneezing

+

One or more of the following:
Conjunctivitis
Dyspnoea
Oral erosions
Diarrhoea or Dysentery
Death



DIFFERENTIAL DIAGNOSIS

- Bluetongue
 - Contagious Caprine Pleuro-Pneumonia (CCPP)
 - Foot-and-Mouth Disease (FMD)
 - Sheep and Goat Pox
 - Orf
 - Bacterial pneumonia
-

PPR DIFFERENTIAL DIAGNOSIS

Disease	Nasal and Ocular Discharges	Mouth lesions	Bronchopneumonia	Diarrhoea
Oestrosis	++	-	-	-
ORF	-	+	-	-
Capripox disease	+	-	+	+
CCPP	-	-	++	-
Blue Tongue	+	+	-	-
Pasteurellosis	+	-	++	-
Rinderpest	++	++	-	++

BLUETONGUE

- AETIOLOGY:** Bluetongue virus (Genus: Orbivirus; Family: Reoviridae)
- TRANSMISSION:** Vector-borne (biting midges belonging to genus Culicoides)
- SPECIES AFFECTED:** Domestic and wild ruminants (e.g., sheep, goats, cattle, buffaloes, deer, camels)
- DISEASE:** Sub-clinical to serious and fatal:
- species and breed affected
 - virus strain
 - husbandry factors



Picture courtesy of Institute of Animal Health, Pirbright

BLUETONGUE CLINICAL SIGNS

Depression and transient pyrexia

Congestion and hyperaemia of oral and nasal mucosa which may become haemorrhagic and eroded

Oedema of the face, eyelids, and ears

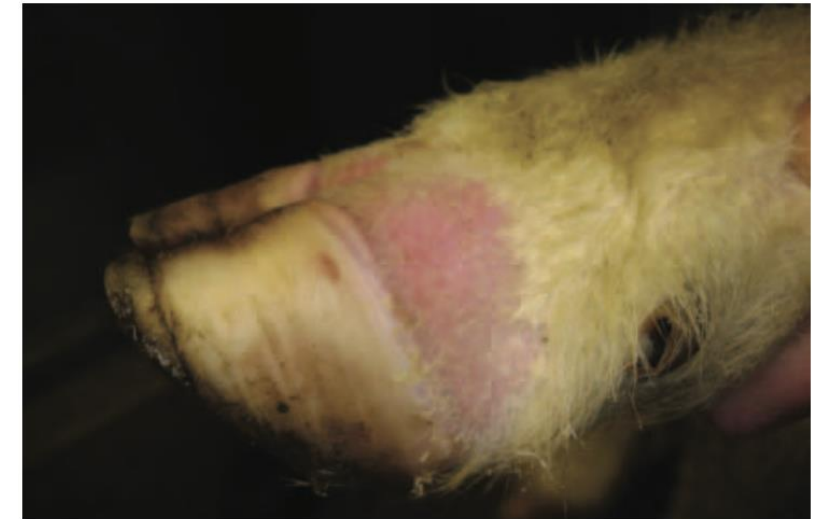
Tongue becomes oedematous and cyanotic

Hyperaemia of coronary band of the hoof, groin, axilla, and perineum

Reluctance to move and torticollis



Picture courtesy of VLA – Bury St Edmunds



Picture courtesy of Arbovirology, Institute for Animal Health, Pirbright

BLUETONGUE POST-MORTEM LESIONS

Inter-alveolar hyperaemia of lungs

Severe alveolar odema

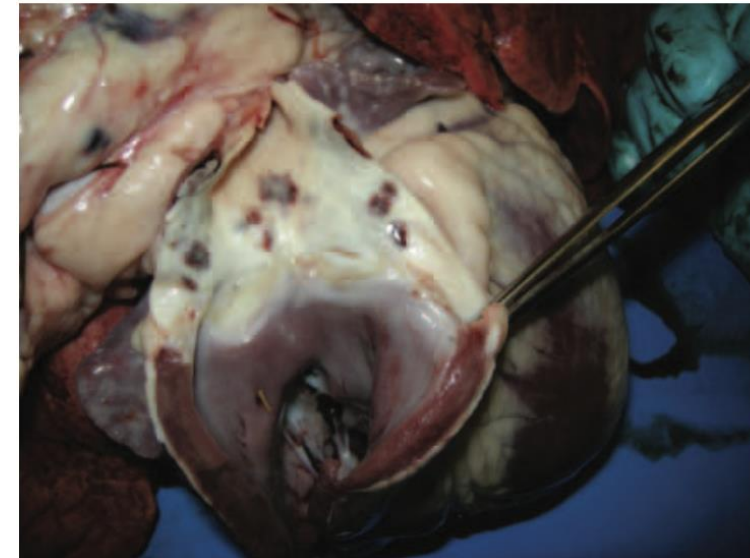
Froth in bronchial tree

Plasma-like fluid in thoracic cavity & pericardial sac

Distinctive haemorrhage near base of pulmonary artery



Picture courtesy of S. Williamson



Picture courtesy of VLA – Bury St Edmunds



CONTAGIOUS CAPRINE PLEURO-PNEUMONIA (CCPP)

AETIOLOGY: *Mycoplasma capricolum subsp. capripneumoniae* (Mccp)

TRANSMISSION: Direct droplet transmission

SPECIES AFFECTED: Primarily goats
Sheep affected in mixed-herds (may act as reservoirs)
Wild ruminants

DISEASE: Peracute, acute, and chronic form

STRICTLY RESPIRATORY

Fever and anorexia

Respiratory signs, e.g., dyspnoea, polypnoea, cough and nasal discharge

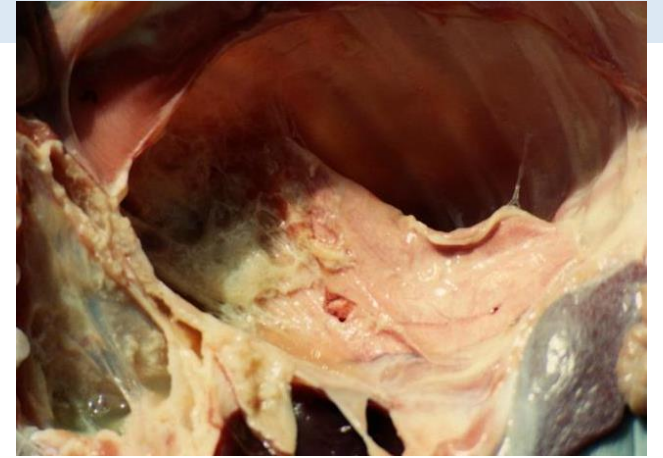


CCPP POST-MORTEM LESIONS

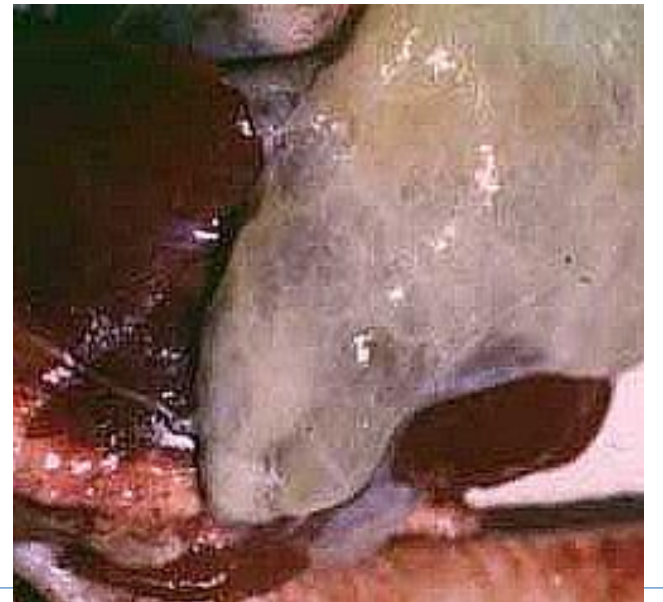
Lung adhesions

Uni-lateral sero-fibrinous pleuropneumonia

Severe pleural effusion with straw-colored thoracic fluid



Picture courtesy of Peter Roeder



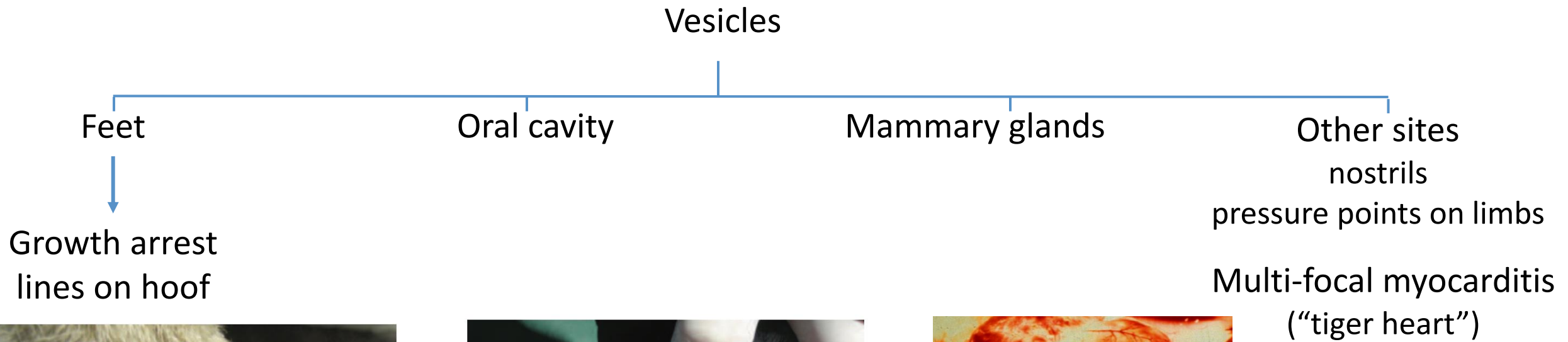
Picture courtesy of ILRI



FOOT-AND-MOUTH DISEASE (FMD)

AETIOLOGY:	FMD virus (Genus: Aphthovirus; Family: Picornaviridae)
TRANSMISSION:	Direct or indirect contact via infected airborne droplets or secretions
SPECIES AFFECTED:	Domestic and wild cloven-hoofed animals, e.g., cattle, goats, sheep, pigs, and water buffalo
DISEASE:	Sub-clinical, mild, to severe clinical manifestation Fatalities may occur especially in young animals

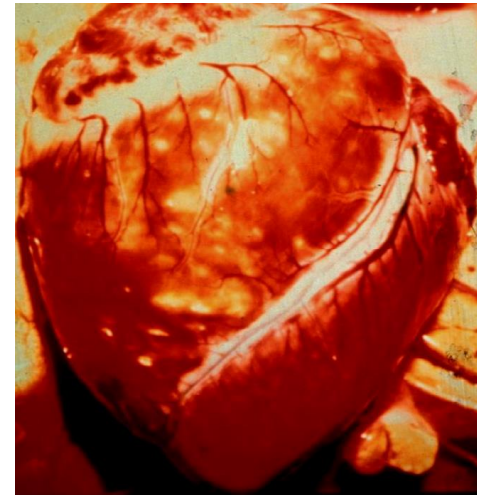
FMD CLINICAL SIGNS & POST-MORTEM LESIONS



Picture courtesy of Ryan Waters



Picture courtesy of Phil Watson



Picture courtesy of Pirbright



SHEEPPOX AND GOATPOX

AETIOLOGY: Sheeppox virus and Goatpox virus
(Genus: Capripoxvirus; Family: Poxviridae)

TRANSMISSION: Via direct contact
Indirectly via infected hides, sheep skin, or unprocessed wool products

SPECIES AFFECTED: Sheep and goats

SHEEPPOX AND GOATPOX CLINICAL SIGNS

Pyrexia (40°C)



Macules

small areas of hyperaemia especially visible on unpigmented skin



Papules

hard swellings of 0.5-1.0 cm in diameter all over the body
or restricted to the groin, axilla and perineum



Papules ulcerate with muco-purulent discharge

Death

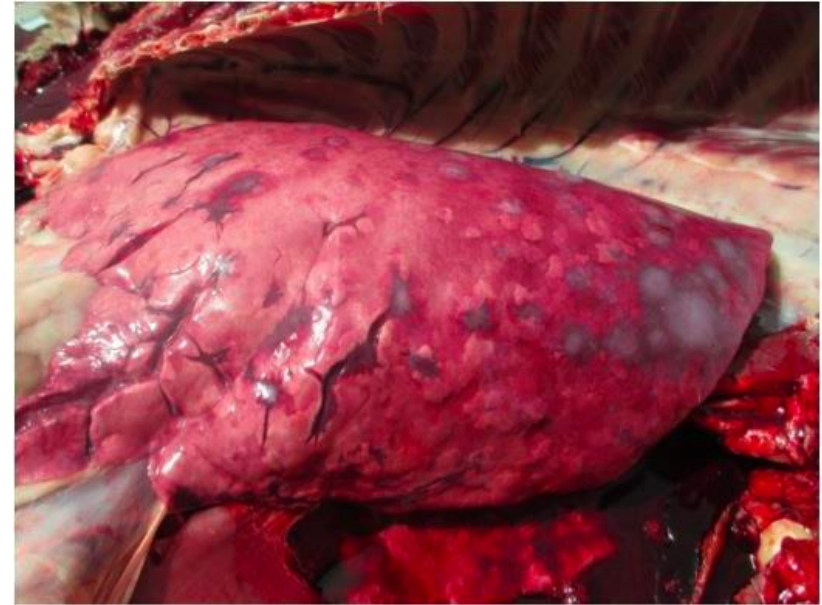
Scabs and skin lesions
susceptible to fly strike

Rhinitis
Conjunctivitis
Enlarged lymph nodes
Blepharitis



SHEEPPOX AND GOATPOX POST-MORTEM LESIONS

- Skin lesions not as obvious during necropsy
- Necrotic mucous membranes
- Lymph nodes enlarged and oedematous
- Ulcerated papules on in gastro-intestinal tract
- Hard lesions throughout the lungs



Picture courtesy of Colin Schrivener



ORF (CONTAGIOUS PUSTULAR DERMATITIS)

AETIOLOGY: Orf Virus (Genus: Parapoxvirus; Family: Poxviridae)

TRANSMISSION: Infection usually established through skin or mucosal abrasions

SPECIES AFFECTED: Sheep and goats
Zoonotic disease

DISEASE: Typically affects young lambs
Can also affect older lambs and adults

ORF CLINICAL SIGNS

Lesions around the mouth and nostrils

Occasionally in the mouth and throat

Sometimes on the feet, tail, udder and teats

Crusts can be picked off revealing granulating areas and raised lesions



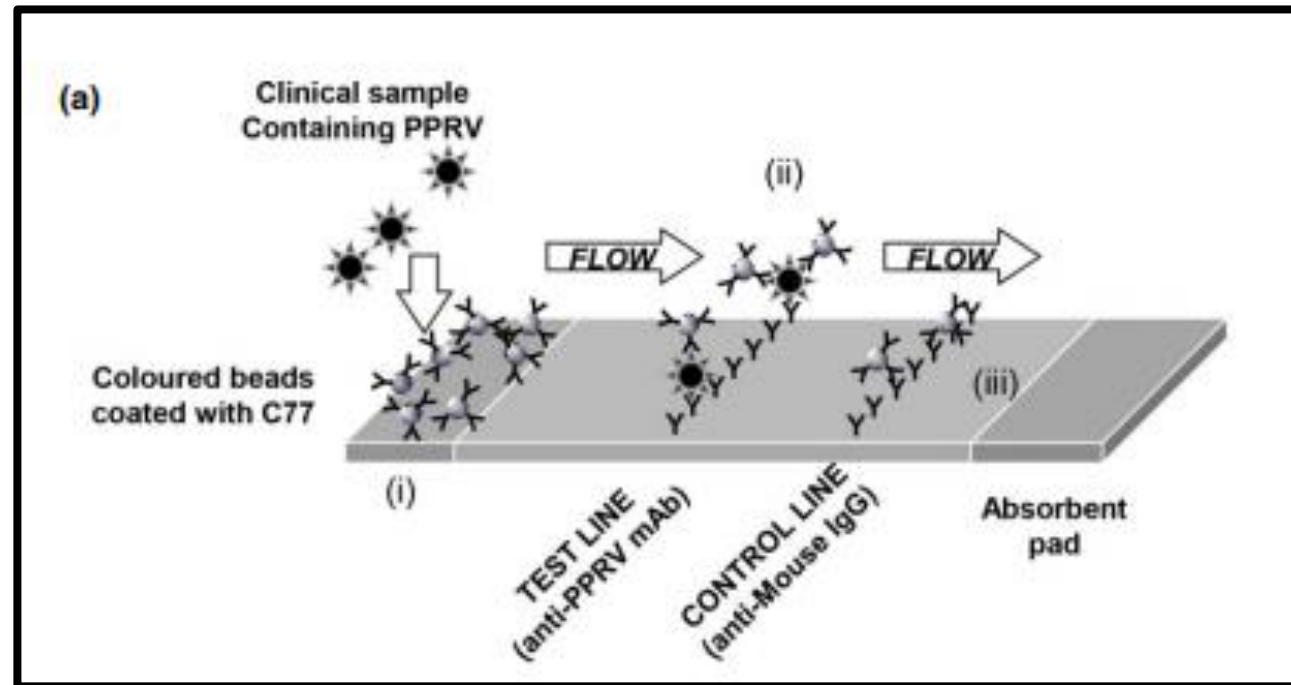


BACTERIAL PNEUMONIA

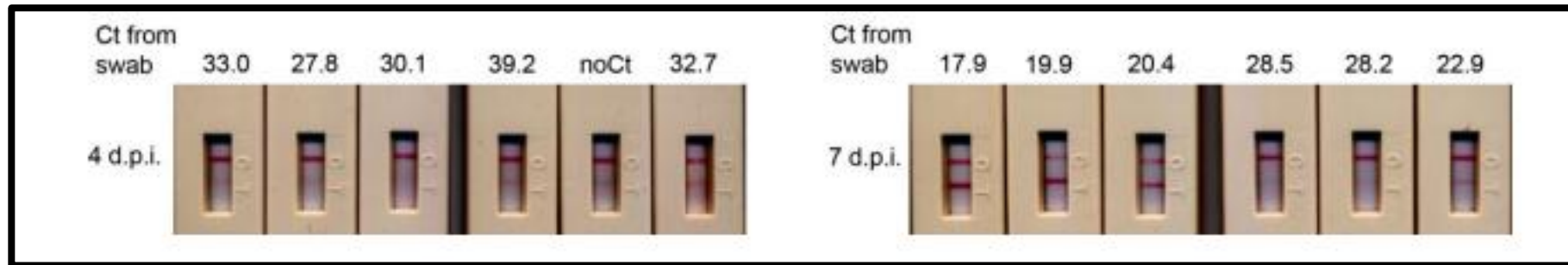
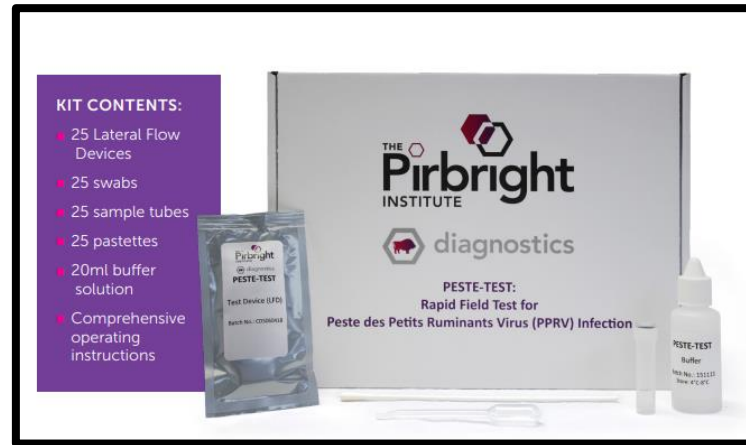
AETIOLOGY:	Bacteria such as <i>Mannheimia haemolytica</i>
CLINICAL SIGNS:	- Rapid onset of fever - Depression and anorexia - Coughing and dyspnoea - Muco-purulent nasal and ocular discharges (encrusted nose) - Fibrinous broncho-pneumonia - Sudden death
SPECIES AFFECTED:	Young lambs
DISEASE:	- Outbreaks triggered by stress factors e.g., transport or climatic changes - Could also be a secondary infection of PPR

(In-field) Rapid tests

Lateral flow device (LFD)



In-field (Rapid) tests



Peste-Test (Baron J, et al. Transbound Emerg Dis. 2014, 61(5):390)

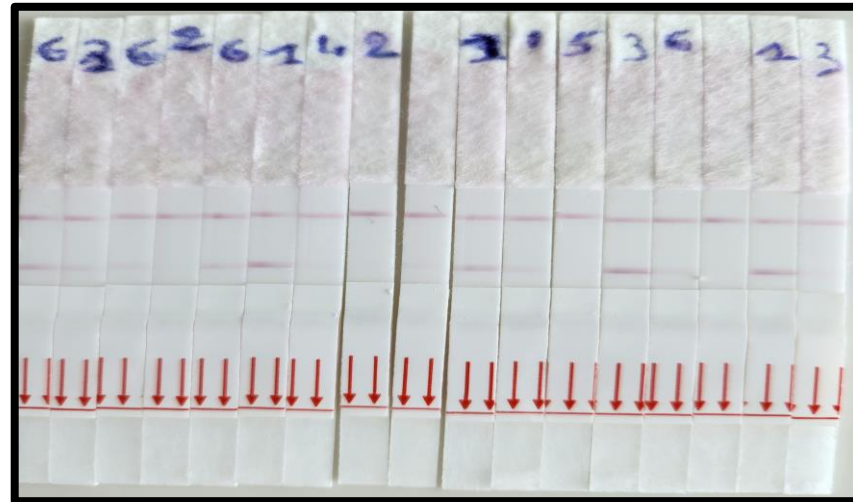
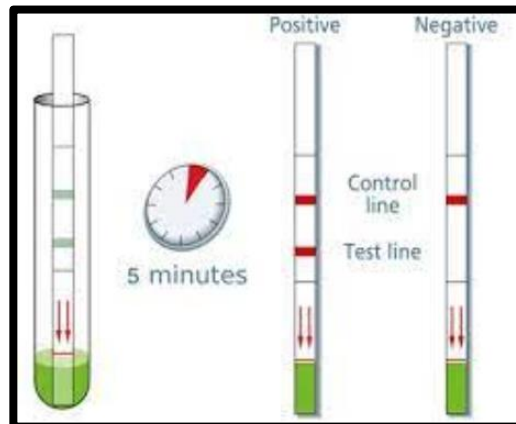
In-field (Rapid) tests

Peste des Petits Ruminants Virus (PPRV)

ID Rapid® PPR Antigen

RAPID TEST Y

Dipstick field test for the detection of PPR Virus infection. Technology based upon reagents developed at a FAO/OIE reference laboratory (CIRAD, Montpellier, France).

The image shows the components of the ID Rapid PPR Antigen kit. It includes a white box with the product name and logo, several small white vials, a white box containing dipstick test strips, and a white box containing control strips. The kit is designed for field use to detect PPR Virus infection.



CONCLUSIONS

PPR is a highly contagious disease of sheep and goats

Causes **pneumo-enteritis syndrome**

Differential diagnosis with other diseases causing similar clinical signs and / or post-mortem lesions

Definitive diagnosis requires lab confirmation

Thank you

