PESTE DES PETITS RUMINANT

VMC 321
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Peste des Petits Ruminants Virus
WHAT IS PESTE DES PETITS RUMINANTS (PPR)?

PESTE DES PETITS RUMINANTS (PPR), ALSO KNOWN AS ‘GOAT PLAGUE’, IS A VIRAL DISEASE OF GOATS AND SHEEP CHARACTERIZED BY FEVER, SORES IN THE MOUTH, DIARRHEA, PNEUMONIA, AND SOMETIMES DEATH.
- Ovine rinderpest
- Kata
- Stomatitis-pneumoenteritis complex,
- Goat plague
- Pseudo-rinderpest

Official agencies such as FAO and OIE use the French name

- “Peste des Petits Ruminants”,
- “Peste-des-Petits-Ruminants”
  or
- “Peste-des-petits-ruminants”
The Organism
CLASSIFICATION OF PPRV

Peste Des Petits Ruminants Virus

Classification

• **Group**: Group V [(-)ssRNA]
• **Order**: Mononegavirales
• **Family**: Paramyxoviridae
• **Genus**: Morbillivirus
• **Species**: Peste-des-petits-ruminants virus
THE ORGANISM

- Family Paramyxoviridae
- Genus *Morbilivirus*
- Closely related to rinderpest virus
  - Very similar antigenically
  - Antibodies are cross-protective
  - Viruses are distinct
CHARACTERISTICS:

It may:

- Survive at 60°C for 60 minutes,
- Stable from pH 4.0 to 10.0,
- Can be killed by alcohol, ether, and detergents most disinfectants
- Long survival time with chilled and frozen tissues
Importance
EPIDEMIOLOGY

• Peste des Petits Ruminants is endemic in :
  • Sub-saharan Africa
  • Arabian Peninsula.
  • Middle Eastern countries
  • India

Morbidity as high as 100%
Mortality can be 90%
PPR was first described in Côte d'Ivoire (West Africa) in 1942. In India, PPR was reported for the first time in 1987 at Chennai.
HOST

• Principally goats and sheep
• Cattle and pigs seroconvert but do not develop or transmit disease
• Wild ungulates can be affected
  • Gazelle, deer, ibex, gemsbok
  • Limited information on species susceptibility, occurrence of disease
MORBIDITY AND MORTALITY

• Young animals most affected
  • Ages 2 months to 2 years
• Varies by species, immunity, breed
• Morbidity and mortality rates
  • Up to 100% in naïve herds
  • Lower in endemic areas
• High case fatality rate
  • Exotic ungulates
Transmission
TRANSMISSION

- Close contact, inhalation
- Virus shed in nasal and ocular secretions, saliva, urine, and feces
- Long-term carriers unlikely
- Role of fomites unclear
  - Do not remain infectious for long

- Sick goats and sheep generate aerosols containing infective droplets.
- Close contact between sick and healthy animals
Disease in Animals
HOST RANGE

• Goats and sheep are the natural host
• Cattle, buffaloes, camels and pigs are susceptible to infection
  – do not exhibit clinical signs and unable to transmit the disease to other animals
• Route of infection is respiratory and is spread by
  • airborne droplets
  • secretions and excretions of infected animals
  • no carrier state exists
**PATHOGENESIS**

<table>
<thead>
<tr>
<th>PPR virus - lymphotropic and epitheliotropic</th>
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<tbody>
<tr>
<td>Respiratory route is the likely portal to entry</td>
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<td>PPR virus penetrates the retropharyngeal mucosa sets up a viremia and specifically damages the alimentary respiratory and lymphoid systems</td>
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<td>Infected cells undergo necrosis and the respiratory system, also undergoes proliferation</td>
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<td>Localizes first replicating in the pharyngeal and mandibular lymph nodes as well as tonsil</td>
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<td>Viraemia develop 2-3 days after infection</td>
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<td>Viremia disseminates virus to spleen, bone marrow and mucosa of the gastro-intestinal tract and the respiratory system</td>
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<td>First clinical sign appears</td>
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<td>Death may occur from severe diarrhea and dehydration, before respiratory lesions become severe</td>
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<td>Pathogenicity is hastened by concurrent diseases such as pneumonic pasteurollosis, coccidiosis or coliformenteritis</td>
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<td>Lymphoid necrosis is not marked as in rinderpest</td>
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<td>Most sheep and some adult goats recover</td>
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CLINICAL SIGNS

• Incubation period
  • 2 to 10 days
• Peracute
• Acute
  • High fever
  • Serous nasal, ocular discharge becomes mucopurulent
  • Hyperemic gums, necrotic oral lesions
CLINICAL SIGNS

- Profuse diarrhea
  - Dehydration
  - Emaciation
- Rapid respiration, dyspnea
- Abortion
- Skin nodules around muzzle
- Subacute, asymptomatic disease
SAMPLING

• Before collecting or sending any samples, the proper authorities should be contacted
• Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease
CLINICAL DIAGNOSIS

• PPR should be considered in:
  • Sheep, goats, or gazelle
  • Acutely febrile, highly contagious disease
  • Oral or GI signs
DIFFERENTIAL DIAGNOSIS

- Rinderpest
- Bluetongue
- Contagious ecthyma
- Foot and mouth disease
- Heartwater
- Coccidiosis
- Mineral poisoning
- Contagious caprine pleuropneumonia
- Pasteurellosis
LABORATORY DIAGNOSIS

- Virus isolation
- Antigen detection
- Serology
- RT-PCR
ISOLATION AND IDENTIFICATION OF PPRV

• Samples to be taken for isolation
  • nasal swabs
  • spleen
  • Heart
  • Discharges,
  • oral lesions,
  • whole blood
• Isolation medium - Vero cells
 primary lamb kidney & lung cells
IDENTIFICATION OF PPRV

I. CPE was characterised initially by rounding and ballooning of cells

II. later-on aggregation of cells followed by formation of fusion mass and syncytia
SEROLOGICAL TEST

- The sandwich ELISA using monoclonal antibody (4G6) directed against an epitope of nucleo-protein of PPR virus
- Haemagglutination inhibition (HI) test
- Agar gel immunodiffusion
- Counter immunoelectrophoresis
DETECTION OF VIRAL RNA

Agarose gel electrophoresis of N gene based RT–PCR products amplified. PPR with an illuminating band at 350bp positive.
**TEST FOR THE DIAGNOSIS OF PESTE DES PETITS RUMINANTS AND THEIR PURPOSE**

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<thead>
<tr>
<th>Method</th>
<th>Purpose</th>
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<tr>
<td></td>
<td>Population freedom from infection</td>
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<tr>
<td>Competitive ELISA</td>
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<td>Virus neutralisation</td>
<td>+++</td>
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<tr>
<td>RT-PCR</td>
<td>–</td>
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<tr>
<td>Real-time RT-PCR (QRT-PCR)</td>
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<tr>
<td>Virus isolation in cell culture</td>
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<tr>
<td>Immunocapture ELISA</td>
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<tr>
<td>Agar gel immunodiffusion</td>
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Prevention and Control
PREVENTION AND CONTROL

• Quarantine
• Movement controls
• Euthanasia of infected and exposed animals
• Cleaning and disinfection of infected premises
VACCINATION

• Outbreaks
  • Ring vaccination, high-risk populations
• Endemic areas
  • Used to control disease
• Vaccine types
  • Attenuated rinderpest vaccine
  • Homologous, attenuated PPR vaccine
  • Recombinant vaccine
DISINFECTION

- PPR virus killed by most common disinfectants
  - Alkalis (sodium carbonate, hydroxide)
  - Halogens (sodium hypochlorite)
    - 2% for 24 hours
  - Phenolic compounds
  - Citric Acid
  - Alcohols
  - Iodophores