

S  
l  
i  
d  
e  
  
1

**Peste des Petits Ruminants**

*Pest of Small Ruminants, Pest of Sheep and Goats, Stomatitis-Pneumoenteritis Complex or Syndrome, Pseudorinderpest of Small Ruminants, Kata, Goat Plague, contagious Pustular Stomatitis*



S  
l  
i  
d  
e  
  
2

**Overview**

- Organism
- Economic impact
- Epidemiology
- Transmission
- Clinical signs
- Diagnosis and treatment
- Prevention and control
- Actions to take



Center for Food Security and Public Health  
Iowa State University - 2004

In today's presentation we will cover information regarding the organism that causes Peste des Petits ruminants and its epidemiology. We will also talk about the economic impact the disease has had in the past and could have in the future. Additionally, we will talk about how it is transmitted, the species it affects, clinical and necropsy signs seen, and diagnosis and treatment of the disease. Finally, we will address prevention and control measures for the disease as well as actions to take if Peste des Petits ruminants is suspected.

S  
l  
i  
d  
e  
  
3

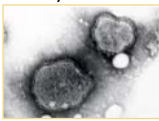
**The Organism**



S  
l  
i  
d  
e  
  
4

**The Organism**

- Family *Paramyxoviridae*
- Genus *Morbillivirus*
- Similar to Rinderpest
- Other members of the family include
  - Measles virus
  - Canine distemper virus
  - Phocid distemper virus of sea mammals



Center for Food Security and Public Health  
Iowa State University - 2004

Peste des Petits Ruminants is an acute or subacute viral disease of goats and sheep characterized by fever, erosive stomatitis, conjunctivitis, gastroenteritis, and pneumonia. The name is French for "disasterous disease of small ruminants". Goats are usually more severely affected than sheep. Peste des petits ruminants (PPR) is a paramyxovirus of the genus Morbillivirus. It is antigenically very similar to the Rinderpest virus. Other members of the genus include measles virus, canine distemper virus and phocid distemper virus of sea mammals (seals). For many years PPR was considered a variant of rinderpest virus, specifically adapted for goats and sheep, that had lost its virulence for cattle. It is now known that the two viruses are distinct though closely related antigenically. (Photo: The morbillivirus that causes PPR)

S  
l  
i  
d  
e  
  
5

**Importance**



S  
l  
i  
d  
e  
6

### History

- 1942: Cote d'Ivoire in West Africa
  - Soon spread to Nigeria, Senegal and Ghana
- 1972: Sudan
- 1990's: Re-emerging as a result of decreases in veterinary services



Center for Food Security and Public Health Iowa State University - 2004

PPR was first described in Côte d'Ivoire in West Africa in 1942. Investigators soon confirmed the existence of the disease in Nigeria, Senegal and Ghana. In 1972 in the Sudan, a disease in goats that was originally diagnosed as rinderpest, was confirmed to be PPR. The renewed spread of PPR as well as other animal diseases in Africa and the Middle East has not only to do with biological factors, but has gone hand in hand with deteriorating standards in national veterinary services in these countries. Changes in government priorities have led to decreased funding and a restructuring which has disrupted national veterinary services.

S  
l  
i  
d  
e  
7

### Economic Impact

- Presence of disease can limit
  - Trade and export
  - Import of new breeds
  - Development of intensive livestock production
- Loss of animal protein for human consumption



Center for Food Security and Public Health Iowa State University - 2004

The presence of PPR can have a serious impact on the economics of a region. Economic losses are due to loss of production, death and abortion. The presence of disease can limit trade, export, import of new breeds and the development of intensive livestock production. PPR is a major constraint on the availability of protein for human consumption as well.

S  
l  
i  
d  
e  
8

### Epidemiology



While PPR is mainly a disease of goats and sheep there is one report of naturally occurring PPR in captive wild ungulates. Experimentally, the American white-tailed deer is fully susceptible. The role of wildlife on the epizootiology of PPR is unknown at this time. Cattle and pigs are susceptible to infection but they do not exhibit clinical signs. These subclinical infections result in seroconversion, and the cattle are protected from challenge with virulent rinderpest virus. Cattle and pigs do not, however, play a role in the epizootiology of PPR because they are apparently unable to transmit the disease to other animals. An outbreak in Indian buffalo in the Tamil Nadu region of South India in 1997 resulted in the death of 48 buffalo, a mortality rate of 96%.

S  
l  
i  
d  
e  
9

### Susceptible Species

- Principally goats and sheep
- One report in captive wild ungulates
- American white tail deer experimentally susceptible
- Role of wildlife in transmission unknown
- Cattle and pigs seroconvert but do not transmit disease
- High mortality in Indian buffalo in 1977

Center for Food Security and Public Health Iowa State University - 2004

Presently, PPR occurs in most African countries situated in a wide belt between the Sahara and the equator; the Middle East (Arabian Peninsula, Israel, Syria, Iraq, Jordan), and the Indian subcontinent.

S  
l  
i  
d  
e  
10

### Geographic Distribution

- Africa, between the Sahara and the equator
- The Middle East
  - Arabian Peninsula, Israel, Syria, Iraq, Jordan
- Indian subcontinent



Center for Food Security and Public Health Iowa State University - 2004

S  
l  
i  
d  
e  
  
1  
1

**Morbidity/Mortality**

- Morbidity 80-90%
- Mortality 50-80%, can be up to 100%
- More severe in young animals, poor nutrition, concurrent parasitic infections
- Goats more susceptible than sheep

Center for Food Security and Public Health  
Iowa State University - 2004

The morbidity and mortality rates from PPR can be up to 100% in severe outbreaks. In milder outbreaks, morbidity is still high but the mortality rate may be closer to 50%. Severity depends upon the susceptibility of the population. Young animals (4-8 months) have more severe disease. Poor nutritional status, stress of movement and concurrent parasitic and bacterial infections enhance the severity of clinical signs. Goats are generally more susceptible than sheep with certain breeds of goats predisposed to infection. The incidence of PPR in an enzootic area is similar to that of rinderpest in that a low rate of infection exists continuously. When the susceptible population builds up, periodic epizootics occur with almost 100% mortality.

S  
l  
i  
d  
e  
  
1  
2


**Transmission**

Center for Food Security and Public Health  
Iowa State University

S  
l  
i  
d  
e  
  
1  
3

**Animal Transmission**

- Close contact
- Virus present in ocular, nasal and oral secretions and feces
- No known carrier state
- Unknown if fomites play a role



Center for Food Security and Public Health  
Iowa State University - 2004

Transmission of PPR requires close contact. The virus is present in ocular, nasal, and oral secretions as well as feces. Most infections occur through inhalation of aerosols from sneezing and coughing animals. Animals may be infectious during the incubation period. There is no known carrier state. There is controversy over whether fomites can play a role in transmission of PPR.

S  
l  
i  
d  
e  
  
1  
4

**Human Transmission**

- The Pestes des Petit ruminants virus does not infect humans

Center for Food Security and Public Health  
Iowa State University - 2004

The PPR virus does not infect humans.

S  
l  
i  
d  
e  
  
1  
5

**Disease in Animals**

Center for Food Security and Public Health  
Iowa State University

S  
l  
i  
d  
e  
  
1  
6

### Clinical Signs

- Incubation period  
– 3 to 10 days
- Acute fever and anorexia
- Upper respiratory discharge progressing to catarrhal exudate



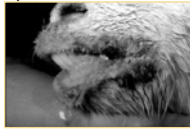
Center for Food Security and Public Health Iowa State University - 2004

Most cases of PPR are acute, with a sudden fever that may last for 5-8 days before the animal either dies or begins to recover. The characteristic signs begin with a serous nasal discharge that becomes mucopurulent. The nasal discharge may remain mild or may progress to a severe catarrhal exudates that crusts over, blocking the nostrils and causing respiratory distress. The nasal mucous membranes may develop small areas of necrosis. The conjunctiva may be congested with crusting on the medial canthus and profuse catarrhal conjunctivitis with matted eyelids is often seen. Necrotic stomatitis is also common and can be severe. (Photo:USDA/APHIS)

S  
l  
i  
d  
e  
  
1  
7

### Clinical Signs

- Profuse diarrhea, dehydration, emaciation, dyspnea and death in 5-10 days
- Bronchopneumonia, abortion
- Prognosis correlated with extent of mouth lesions



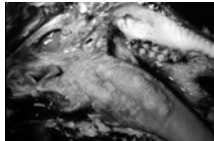
Center for Food Security and Public Health Iowa State University - 2004

Concurrently, animals will most likely have profuse, non-hemorrhagic diarrhea resulting in severe dehydration, which may progress to emaciation, dyspnea, hypothermia and death within 5-10 days. Bronchopneumonia with coughing is common late in the disease. Abortion may be seen in pregnant animals. The prognosis of acute PPR is usually poor. The severity of the disease and outcome in the individual is correlated with the extent of the mouth lesions. Prognosis is good in cases where the lesions resolve within 2 to 3 days. It is poor when extensive necrosis and secondary bacterial infections result in a fetid odor from the animals mouth. Respiratory involvement is also a poor prognostic sign. Photo: USDA/APHIS

S  
l  
i  
d  
e  
  
1  
8

### Post Mortem Lesions

- Inflammatory and necrotic lesions  
– Oral cavity  
– Throughout gi tract
- Emaciation
- "Zebra stripe" lesions of congestion in large intestine



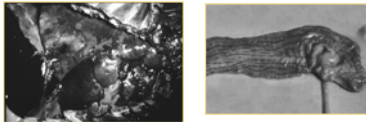
Center for Food Security and Public Health Iowa State University - 2004

Post mortem lesions are similar to rinderpest, with inflammatory and necrotic lesions in the oral cavity and throughout the GI tract. In severe cases the hard palate, pharynx and upper esophagus also have lesions (above photo). The carcass is generally emaciated. Photo: USDA/APHIS

S  
l  
i  
d  
e  
  
1  
9

### Post Mortem Lesions

- Bronchopneumonia and other respiratory lesions
- Enlarged lymph nodes
- Lesions similar to Rinderpest



Center for Food Security and Public Health Iowa State University - 2004

The most severe lesions are seen in the large intestine, with congestion and "zebra stripes" of congestion on the mucosal folds of the posterior colon. Erosive lesions may also occur in the vulva and vaginal mucous membranes. Bronchopneumonia with consolidation and atelectasis occurs frequently. Congestion and enlargement of the spleen may be seen. The lymph nodes are generally congested, enlarged and edematous. (Photo: USDA/APHIS – Left photo shows pneumonia, right slide shows zebra striping on intestine)

S  
l  
i  
d  
e  
  
2  
0

### 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

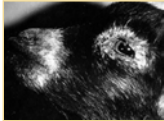
Center for Food Security and Public Health Iowa State University - 2004

Before collecting or sending any samples from animals with a suspected foreign animal disease, 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.

S  
l  
i  
d  
e  
  
2  
1

**Clinical Diagnosis**

- Clinical
  - PPR should be considered in any acutely febrile, highly contagious disease with oral erosions and GI signs



Center for Food Security and Public Health  
Iowa State University - 2004

PPR should be considered in sheep or goats with any acutely febrile, highly contagious disease with oral erosions and/or gastrointestinal signs. The photo above shows dried exudate on the muzzle and around the eye resulting from rhinitis and conjunctivitis courtesy of the Gray Book at [http://www.vet.uga.edu/vpp/gray\\_book/photos/pages/088.htm](http://www.vet.uga.edu/vpp/gray_book/photos/pages/088.htm)

S  
l  
i  
d  
e  
  
2  
2

**Differential Diagnosis**

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


Center for Food Security and Public Health  
Iowa State University - 2004

Differential diagnosis include: rinderpest, contagious caprine pleuropneumonia, bluetongue, pasteurellosis, contagious ecthyma, foot and mouth disease, heartwater, coccidiosis, Nairobi sheep disease and mineral poisoning. The case history, geographic location and the combination of clinical signs can help differentiate some of these diseases.

S  
l  
i  
d  
e  
  
2  
3

**Diagnosis**

- Laboratory Tests
  - Wide variety are used for detecting virus, viral antigen, viral nucleic acid and antibody



Center for Food Security and Public Health  
Iowa State University - 2004

Laboratory tests – A wide range of laboratory procedures have been described for detecting virus or viral antigen, viral nucleic acid and antibody.

S  
l  
i  
d  
e  
  
2  
4

**Diagnosis**

- Samples
  - Swabs of conjunctival, nasal, buccal and rectal discharges
  - Whole blood collected on heparin
  - Lymph nodes, especially mesenteric and bronchial nodes
  - Spleen
  - Large intestine and lungs
- Transport under refrigeration

Center for Food Security and Public Health  
Iowa State University - 2004

Samples that should be taken if PPR is suspected are swabs of the conjunctival, nasal, buccal and rectal discharges. Whole blood must be collected on heparin. Samples of the lymph nodes particularly the mesenteric and bronchial nodes. Samples may also be taken of the spleen, large intestine and lungs. These samples should be transported under refrigeration.

S  
l  
i  
d  
e  
  
2  
5

**Treatment**


- No specific treatment
- Drugs to control bacterial and parasitic complications may decrease mortality
- Supportive care

Center for Food Security and Public Health  
Iowa State University - 2004

There is no specific treatment for PPR. However, drugs that control bacterial and parasitic complications, as well as supportive care, may decrease mortality.

S  
l  
i  
d  
e  
  
2  
6

**Prevention and Control**



S  
l  
i  
d  
e  
  
2  
7

**Recommended Actions**

- Notification of Authorities
  - Federal:  
Area Veterinarian in Charge (AVIC)  
[www.aphis.usda.gov/vs/area\\_offices.htm](http://www.aphis.usda.gov/vs/area_offices.htm)
  - State veterinarian  
[www.aphis.usda.gov/vs/sregs/official.htm](http://www.aphis.usda.gov/vs/sregs/official.htm)
- Quarantine

Center for Food Security and Public Health  
Iowa State University - 2004

If you suspect a case or outbreak of Peste des Petits Ruminants, contact your state and/or federal veterinarian immediately and establish a quarantine of the premise.

S  
l  
i  
d  
e  
  
2  
8

**Disinfection**

- PPR virus killed by most common disinfectants
  - Phenols
  - Sodium hydroxide 2% for 24 hours
  - Ether
  - Detergents
- Virus survives for long periods in chilled or frozen tissues

Center for Food Security and Public Health  
Iowa State University - 2004

The PPR virus can be killed by most common disinfectants (phenol, or sodium hydroxide 2% for 24 hours) as well as alcohol, ether, and detergents. The virus can survive for long periods of time in chilled or frozen tissues.

S  
l  
i  
d  
e  
  
2  
9

**Vaccination**

- Rinderpest vaccine used in Africa
  - effective for 12 months against PPR
- Vaccination hinders ongoing efforts at rinderpest eradication
- Homologous attenuated PPR vaccine is being tested and may soon be commercially available

Center for Food Security and Public Health  
Iowa State University - 2004

The tissue culture rinderpest vaccine protects goats for at least 12 months against PPR. The vaccine is currently used in many African countries for vaccination against PPR. The efficacy notwithstanding, its wide use hinders the ongoing Pan-African rinderpest campaign because it is impossible to determine if seropositive small ruminants have been vaccinated or are naturally infected with rinderpest virus. A homologous attenuated PPR vaccine is being tested and may soon be commercially available.

S  
l  
i  
d  
e  
  
3  
0

**Control and Eradication**


- Affected area should be quarantined
- Infected animals slaughtered
- Carcasses burned or buried
- Proper disposal of contact fomites, decontamination
- Import restrictions

Center for Food Security and Public Health  
Iowa State University - 2004

Eradication is recommended when PPR appears in new areas. Methods that have been successfully applied for rinderpest eradication would be appropriate for PPR. These should include quarantine, slaughter, and proper disposal of carcasses and contact fomites, decontamination, and restrictions on importation of sheep and goats from affected areas.

S  
l  
i  
d  
e  
  
3  
1

**Additional Resources**



S  
l  
i  
d  
e  
  
3  
2

**Internet Resources**


- World Organization for Animal Health (OIE) website  
– [www.oie.int](http://www.oie.int)
- Food and Agriculture Organization of the United Nations  
– [www.fao.org](http://www.fao.org)
- USAHA Foreign Animal Diseases – “The Gray Book”  
– [www.vet.uga.edu/vpp/gray\\_book](http://www.vet.uga.edu/vpp/gray_book)

Center for Food Security and Public Health  
Iowa State University - 2009

S  
l  
i  
d  
e  
  
3  
3

**Acknowledgments**

*Development of this presentation was funded by a grant from the Centers for Disease Control and Prevention to the Center for Food Security and Public Health at Iowa State University.*



S  
l  
i  
d  
e  
  
3  
4

**Acknowledgments**

**Authors:** Jamie Snow, DVM, MPH  
Katie Steneroden, DVM

**Co-authors:** Anna Rovid Spickler, DVM, PhD  
Radford G. Davis, DVM, MPH

**Reviewer:** Bindy Comito Sornsins, BA

