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**Sheep and Goat Pox**  
*Variola caprina*




Sheep and goat pox infection are the most important pox diseases of domestic animals, causing significant economic losses, especially among young animals, where the mortality is greatest.

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**Overview**

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




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In today's presentation we will cover information regarding the organism that causes sheep and goat pox 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 sheep and goat pox is suspected. (Photos: USDA)

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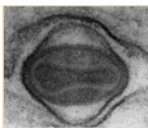
**The Organism**



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**Sheep and Goat Pox**

- Family Poxviridae  
– Genus *Capripoxvirus*
- Only one serotype
- Prolonged survival in the environment
- Survives in scabs for 3 months



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Sheep pox and goat pox are classified together with lumpy skin disease virus in the genus *Capripoxvirus* (Family: Poxviridae). Most isolates cause disease mainly in sheep or mainly in goats but some isolates can cause serious disease in both species. The causative viruses cannot be distinguished from each other with current techniques. Only one serotype exists. The virus is thought to have prolonged survival in the environment and can be found in scab material on recovered animals for 3 months. Photo of electron micrograph of poxvirus from [www.ncbi.nlm.nih.gov/ICTVdb/ICTVdb/58000000.htm](http://www.ncbi.nlm.nih.gov/ICTVdb/ICTVdb/58000000.htm).

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**Importance**



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**Economic Impact**

- Presence of disease can limit:
  - Trade
  - Export
  - Import of new breeds
  - Development of intensive livestock production




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Sheep and goat pox are contagious viral skin diseases. These diseases may be mild in indigenous breeds from endemic areas, but are often fatal in newly introduced animals. Pox infections can limit trade, export, and the development of intensive livestock production. They may also prevent the import of new breeds. (Photo: USDA)

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**Epidemiology**



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**History and Geographic Distribution**

- 1879: Goat pox
  - Norway
- 2nd Century AD: Sheep pox
  - Central and North Africa
  - Central Asia
  - The Middle East
  - Portions of India



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Goat pox was first reported in 1879 in Norway and later observed in Macedonia during the first world war. Sheep pox was likely present in Asia and Europe as early as the second century AD and it's infectious nature was recognized in the mid-18<sup>th</sup> century. Today Sheep pox and goat pox are found in central and north Africa, central Asia, the Middle East and parts of the Indian subcontinent. A mild pox-like disease has been reported in California but is unlikely to be a capripox virus. (Photos: USDA)

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**Morbidity/Mortality**

- Mortality up to 50% in fully susceptible flock
- Mortality up to 100% in young animals
- Symptoms severe in animals
  - Stressed
  - With concurrent infections
  - Naive animals


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Morbidity and mortality vary with the breed of the host and the strain of the virus. Mortality may be up to 50% in a fully susceptible flock and as high as 100% in young animals. Mild infections are common in indigenous breeds, however, symptoms may be more severe in kids or lambs, stressed animals, animals that have concurrent infections, or animals from areas where pox has not occurred for some time.

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**Morbidity/Mortality**

- European sheep breeds highly susceptible
- Subclinical cases may occur
- Only sheep and goats affected
  - Not seen in wild ungulates




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Imported breeds of sheep and goats usually develop severe disease when they are moved into an endemic area. European sheep breeds are highly susceptible to the virus. Subclinical cases may occur. Sheep and goat pox viruses cause disease only in these two species. Infections have not been seen in wild ungulates.

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**Transmission**



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**Animal Transmission**

- Infectious virus in all secretions, excretions and scabs
- Close contact
- Inhalation of aerosols
- Transmission also through abraded skin
- Chronic carriers are not seen



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Sheep pox and goat pox viruses are usually transmitted by close contact. Inhalation of aerosols containing virus and contact through abraded skin by fomites or direct contact are the natural means of transmission. Insect transmission is possible, but their role in transmission is not clear. Infectious virus is found in all secretions, excretions, and the scabs from skin lesions (pictured above). Contagious aerosols may also be generated from dust that contains pox scabs. Chronically infected carriers are not seen. Photo source: USDA.

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**Human Transmission**


- Sheep and goat pox viruses do not appear to infect humans

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Sheep and Goat pox viruses does not appear to infect humans.

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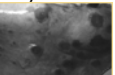

**Animals and Sheep or Goat Pox**



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**Clinical Signs**

- Incubation period: 4 - 13 days
  - Fever
  - Conjunctivitis
  - Depression, anorexia
  - Dyspnea, nasal or ocular discharge
  - Secondary bacterial infections are common

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Incubation period is 8 to 13 days in most natural infections, but may be as short as 4 days. All ages of sheep and goats can be affected, however, disease is more severe in young animals. Systemic signs may include fever (104-107.6°F), conjunctivitis, rhinitis, lymphadenopathy, anorexia and depression. Lung lesions can cause dyspnea (above photo). The mucous membranes can become necrotic and animals may develop a mucopurulent nasal or ocular discharge (bottom photo). Secondary bacterial infections are common and death can occur at any stage of the disease. Some European breeds of sheep die before the characteristic skin lesions appear. (Photos: USDA)

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### Clinical Signs

- Papules forming into hard scabs
- Lesions may cover body or be restricted to axilla, perineum and groin, ears or tail
- Death may occur at any stage



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The first sign of infection is a fever, followed by erythematous macules that develop into hard papules (pictured above). Dark, hard scabs eventually form and may take up to six weeks to heal. Skin lesions can be restricted to the axilla, perineum, and groin or may cover the body. In animals with heavy wool, the lesions can be easier to find by palpation than visual inspection. Mild infections can easily be missed as only a few lesions may be present, often around the ears or the tail. Death may occur at any stage (Photos: USDA).

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### Post Mortem Lesions

- Skin macules and papules
- Papules may extend into the musculature
- Nodules in lungs
- Swollen lymph nodes



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The skin usually contains macules and papules, with areas of edema, hemorrhage, congestion, necrosis, and vasculitis. The papules penetrate through both the dermis and epidermis (right photo); in severe cases they may extend into the musculature. The lungs often contain discrete congested or edematous lesions or hard white nodules (left photo). Papules or ulcerated papules are common on the abomasal mucosa. They may also be found on the rumen, large intestine, trachea, esophagus, tongue, and hard or soft palate. Pale foci are sometimes present on the surface of the kidney, liver, and testicles. The lymph nodes are usually swollen and the mucous membranes may be necrotic. Photo sources include USDA-APHIS, right photo, www.fao.org

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### Differential Diagnosis

- Contagious exthyma
- Bluetongue
- Mycotic dermatitis
- Sheep scab
- Mange
- Photsensitization
- Peste des petits ruminants
- Parasitic pneumonia
- Caseous lymphadenitis
- Insect bites

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Differential diagnosis includes contagious ecthyma (contagious pustular dermatitis), bluetongue, mycotic dermatitis, sheep scab, mange, photosensitization, peste des petits ruminants, parasitic pneumonia and caseous lymphadenitis and insect bites.

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### 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

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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.

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### Diagnosis

- Clinical:
  - Suspect in animals with characteristic full-thickness skin lesions, fever and lymphadenitis
- Laboratory Tests:
  - Virus isolation, electron microscopy, virus neutralization, indirect fluorescent antibody test
  - Characteristic histopathological lesions

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Sheep or goat pox should be suspected in animals with the characteristic full-thickness skin lesions, fever, and lymphadenitis. Dyspnea may also be seen. Laboratory procedures for the diagnosis of Sheep and Goat Pox include virus isolation; observation of the virus by electron microscopy; detection of antibody by virus neutralization, the indirect fluorescent antibody test, or both; and characteristic histopathologic lesions.

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**Treatment**

- Antibiotics for secondary infection
- Good nursing care



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Treatment is directed at preventing or controlling secondary infection. Administration of antibiotics to control secondary infection and good nursing care are recommended.

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**Public Health Significance**


- No conclusive evidence of infection in humans
- Anecdotal reports of sheep or goat pox lesions in humans in India and Sweden
  - Not verified by virus isolation

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There is no conclusive evidence that sheep and goat Pox viruses can infect humans. A report from India that implied that goat pox caused human infection was merely based on clinical signs. There was no attempt to isolate the causative virus or perform serology on the convalescent serums of the three patients to differentiate the infection from contagious ecthyma, which is a known zoonotic agent that occurs worldwide. A report from Sweden indicated that human infection occurred during an outbreak of goat pox. Although serological studies seemed to indicate that the apparent causative agent of the outbreak was not vaccinia or contagious ecthyma, no virus was isolated.

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**Prevention and Control**



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State and federal veterinarians should be immediately informed of any suspected case of goat pox or sheep pox.

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**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

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The most likely manner for sheep pox or goat pox to enter a new area is by introduction of infected animals. Restrictions on the movement of animals and animal products (meat, hair, wool, and hides) are essential to prevent introduction of the disease. Wool, hair, and hides must be subjected to suitable decontamination procedures before entry into non-endemic areas.

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**Prevention**

- Non-endemic areas – keep free with import restrictions and proper quarantine
- Prevent introduction of infected animal products
  - Meat, hair, wool, hides

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### Control and Eradication

- Endemic areas
  - Vaccinate
- Outbreak in endemic area -small scale
  - Quarantine, slaughter infected and exposed, clean and disinfect
  - Ring vaccination
- Outbreak in endemic area -large scale
  - Massive vaccination
  - Movement restrictions

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The most effective means of controlling losses in an endemic area is vaccination. However, even with vaccination, consideration still should be given to eliminating infected and exposed herds by slaughter, proper disposal of animals and contaminated material, and by cleaning and disinfecting contaminated premises, equipment, and facilities. If the disease has spread extensively in an endemic area, massive vaccination followed by cessation of vaccination and control of animal movements from the area represent a strong strategy to control and eradicate sheep and goat pox.

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### Control and Eradication

- Outbreak in non-endemic area
  - Quarantine, slaughter infected and exposed, clean and disinfect
  - Ring vaccination
- No carrier state
- Isolate infected herds and sick animals for at least 45 days after recovery

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If a small scale outbreak of sheep or goat pox occurs in an area usually free of it, place a quarantine around the infected area, slaughter infected and exposed animals and clean and disinfect the premises. Consider ring vaccination. A carrier state has not been shown for SGPV. However, the virus may persist for many months on contaminated premises. Quarantine of areas and premises containing infected or exposed animals is required to prevent disease spread. Isolate infected herds and sick animals for at least 45 days after recovery.

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### Disinfection

- Sodium hypochlorite
- Phenol 2% for 15 minutes
- Detergents
- Virus can survive
  - For 2 months in wool
  - For 6 months in the environment
  - for many years in dried scabs



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Sodium hypochlorite is an effective disinfectant. Inactivated by phenol (2%) in 15 minutes. Sensitive to detergents, such as those containing sodium dodecyl sulfate. The above photo depicts a strong disinfectant. The virus can survive for many years in dried scabs at ambient temperatures. Virus remains viable in wool for 2 months and on premises for as long as 6 months.

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### Vaccination

- Vaccination can provide effective control in endemic areas
- Killed vaccines do not provide long lasting immunity
- Attenuated virus vaccines give immunity up to 2 years

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In endemic areas, vaccination is an effective means of controlling losses from SGP. Killed vaccines have not proved to be practical under field conditions because they do not provide solid lasting immunity. There are numerous attenuated virus vaccines. Immunity lasts up to 2 years.

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### Additional Resources



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### Additional Resources

- World Organization for Animal Health (OIE) website  
– [www.oie.int](http://www.oie.int)
- USAHA Foreign Animal Diseases – “The Gray Book”  
– [www.vet.uga.edu/vpp/gray\\_book/index](http://www.vet.uga.edu/vpp/gray_book/index)

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### Acknowledgments

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