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**Lumpy Skin Disease**

*Pseudourticaria,  
Neethling Virus Disease,  
Exanthema Nodularis  
Bovis, Knopvelsiekte*



Lumpy skin disease is also referred to as pseudourticaria, neethling virus disease, exanthema nodularis bovis, and knopvelsiekte.

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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 Lumpy Skin Disease 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 Lumpy Skin Disease is suspected.

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**The Organism**



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**Lumpy Skin Disease Virus**

- Family Poxviridae  
– Genus Capripoxvirus
- Closely related to sheep and goat pox
- Cannot be differentiated with routine serology




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Lumpy skin disease (LSD) is an acute to chronic viral disease of cattle that is characterized by skin nodules. Lumpy skin disease is caused by a virus in the family Poxviridae, genus *Capripoxvirus*. It is closely related antigenically to sheep and goat pox viruses. These viruses cannot be differentiated using routine serological testing. (Photos: USDA-APHIS)

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**Importance**



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### History and Geographic Distribution

- 1929: Southern and eastern Africa
- Disease of cattle
- Experimental infection
  - Oryx, giraffe and impala
- Virus will replicate in sheep and goats
- 1990's: Resurgence in Africa



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LSD was first described in Zambia (then Northern Rhodesia) in 1929 and extended northwards through sub-Saharan West Africa through a series of epizootics through the 1960's. LSD is a disease of cattle, but the oryx, giraffe and impala are susceptible to experimental infection. The role of wildlife in transmission or as reservoir is unknown. LSD virus will also replicate in sheep and goats following inoculation. During the 1990's there has been a resurgence of the disease in southern Africa probably owing to high rainfall and low level of host immunity. (Photo: USDA-APHIS)

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### Economic Impact

- Major economic importance due to loss of production
  - Severe emaciation
  - Lowered milk production
  - Abortion
  - Secondary mastitis
  - Loss of fertility
  - Extensive damage to hides
  - Loss of draft from lameness

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Although the mortality rate is usually low, the disease is of major economic importance due to production losses resulting from severe emaciation, lowered milk production, abortion, secondary mastitis, loss of fertility, extensive damage to hides and a loss of draft from lameness.

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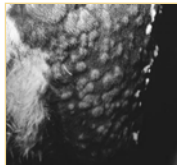
### Epidemiology



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### Morbidity/ Mortality

- Morbidity
  - 3% to 85%
- Mortality
  - 1% to 2% usually
  - 20% to 85% in some cases



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The morbidity rate in cattle can vary from 3 to 85% depending on the presence of insect vectors and host susceptibility. Mortality is low in most cases (1-2%) but can be as high as 20-85%. Unusually high mortality rates (75-85%) in some outbreaks has not been explained. (Photo: USDA-APHIS)

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### Transmission



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### Animal Transmission

- Primary route: Mosquitoes and flies
- Minor route:
  - Direct contact via cutaneous lesions, saliva, nasal discharge, milk, semen, muscles,
- Virus can survive up to 35 days in desiccated crusts
- No carrier state
- Spread related to movement of cattle

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Transmission of the LSD virus is primarily by biting insects, particularly mosquitoes (eg. *Culex mirificens* and *Aedes natrionus*) and flies (eg. *Stomoxys calcitrans* and *Biomyia fasciata*). Epidemics occur in the rainy seasons. Direct contact is also a minor source of infections. Virus can be present in cutaneous lesions, saliva, nasal discharge, milk, and semen. The virus can survive in desiccated crusts for up to 35 days. There is no carrier state. The spread of the disease is often related to movement of cattle.

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### Human Transmission

- There is no evidence that lumpy skin disease virus affects humans

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There is no evidence that the lumpy skin disease virus affects humans.

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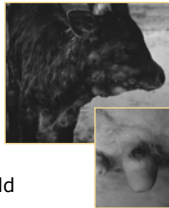
### Animals and Lumpy Skin Disease



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### Clinical Signs

- Incubation period
  - 5 days to 5 weeks
- Inapparent to severe infection
  - worse in young cattle
- Fever
- Decreased milk yield



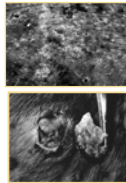
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The incubation period varies from 2 to 5 weeks. Clinical signs can range from inapparent to severe. Host susceptibility, dose and route of virus inoculation affect the severity of disease. Young calves often have more severe disease. Milk yield is decreased, temperature rises, ten days later nodules appear on the skin, anywhere on the body. (Photos: USDA-APHIS)

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### Clinical Signs

- Raised, circular firm nodules coalescing into plaques
  - Anywhere on the body
  - May harden into "sitfast" and be shed
- Swollen/tender udder or testicles
- Tongue, gum and hard palate lesions
- Abortion and sterility



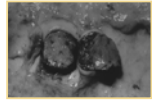
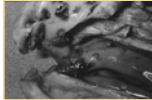
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Skin nodules may be few in number, to many hundred and may coalesce to form plaques. The udder or testicles are swollen and tender. Yellowish-grey lesions can occur on the tongue, the hard palate, gums and in the nostrils. The superficial lymph nodes are swollen, there may be edema of the limbs, and subcutaneous swelling of the brisket and abdominal wall. Cellulitis and sloughing of large areas of skin occur. Sterility in bulls and abortion in cows may occur, and the disease can affect almost all organs. The swollen skin nodules may separate from the healthy skin and dry and harden to form a "sitfast". If the "sitfast" is shed, an ulcerative nodule remains. (Photos-USDA-APHIS)

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### Post Mortem Lesions

- Characteristic skin nodules
- Lesions in the mucous membranes throughout the GI tract
- Nodules in lungs
- Hemorrhages in spleen, liver or rumen



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Post mortem lesions can be extensive. Characteristic deep nodules are found in the skin which penetrate into the subcutaneous tissues and muscle with congestion, hemorrhage, edema, vasculitis, and necrosis. Lesions may also be found in the mucous membranes of the oral and nasal cavities as well as the gastrointestinal tract, lungs, testicles, and urinary bladder. There are nodules in the lungs at post-mortem examination. Bronchopneumonia may be present. Enlarged superficial lymph nodes are common. Synovitis and tenosynovitis may be seen with fibrin in the synovial fluid. Hemorrhages may occur in the spleen or the liver and rumen. The top photo are lesions in the oral cavity, lower photo is a sitfast. (USDA-APHIS)

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### Differential Diagnosis

- Pseudo-lumpy skin disease
- Bovine herpes mammillitis
- Dermatophilosis
- Ringworm
- Insect or tick bites
- Rinderpest
- Demodicosis
- *Hypoderma bovis* infection
- Photosensitization
- Bovine papular stomatitis
- Urticaria
- Cutaneous tuberculosis
- Onchocercosis

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Differential diagnoses include pseudo-lumpy skin disease (a much milder disease caused by a herpesvirus), bovine herpes mammillitis (a disease with lesions generally confined to the teats and udder), dermatophilosis, ringworm, insect or tick bites, besnoitiosis, rinderpest, demodicosis, *Hypoderma bovis* infection, photosensitization, bovine papular stomatitis, urticaria, cutaneous tuberculosis, and onchocercosis.

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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 with characteristic skin nodules ("sitfast"), fever and low mortality
- Laboratory Tests
  - Virus isolation and identification
  - Electron microscopy in combination with history
  - Serology, cross reactions with other poxviruses may occur

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Clinical – Lumpy skin disease can be suspected with clinical signs of a contagious disease with the characteristic skin nodules (sitfast), fever, emaciation and low mortality. Laboratory tests – confirmation of lumpy skin disease in a new area requires virus isolation and identification. Antigen testing can be done using direct immunofluorescent staining, virus neutralization, or ELISA. Typical capripox (genus) virions can be seen using transmission electron microscopy of biopsy samples or desiccated crusts. This finding, in combination with a history of generalized nodular skin lesions and lymph node enlargement in cattle, can be diagnostic. Serological tests include an indirect fluorescent antibody test, virus neutralization, and ELISA. Cross reactions may occur with other poxviruses.



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### Treatment

- Animals generally recover with good nursing care
- Antibiotics for secondary infection
- Up to 6 months for severely affected animals to recover fully

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Animals infected with LSD virus generally recover. Complete recovery may take several months and may be prolonged where secondary bacterial infection occur. Treatment is directed at preventing or controlling secondary infection and it may take up to 6 months for animals severely affected by LSD virus to recover fully. Administration of antibiotics to control secondary infection and good nursing care are recommended.

S l i d e  2 1	<div style="text-align: center;"> <h2>Lumpy Skin Disease in Humans</h2>  </div>	<p>There is no evidence that the lumpy skin disease virus affects humans.</p>
S l i d e  2 2	<div style="text-align: center;"> <h2>Prevention and Control</h2>  </div>	
S l i d e  2 3	<div style="text-align: center;"> <h3>Recommended Actions</h3> <ul style="list-style-type: none"> <li>• Notification of Authorities           <ul style="list-style-type: none"> <li>– Federal: Area Veterinarian in Charge (AVIC) <a href="http://www.aphis.usda.gov/vs/area_offices.htm">www.aphis.usda.gov/vs/area_offices.htm</a></li> <li>– State veterinarian <a href="http://www.aphis.usda.gov/vs/sregs/official.htm">www.aphis.usda.gov/vs/sregs/official.htm</a></li> </ul> </li> <li>• Quarantine</li> </ul> <small>Center for Food Security and Public Health Iowa State University - 2004</small> </div>	<p>If you suspect a case or outbreak of lumpy skin disease, contact your state and/or federal veterinarian immediately and establish a quarantine of the premise.</p>
S l i d e  2 4	<div style="text-align: center;"> <h3>Disinfection</h3> <ul style="list-style-type: none"> <li>• Susceptible to:           <ul style="list-style-type: none"> <li>– Ether (20%)</li> <li>– Chloroform</li> <li>– Formalin (1%)</li> <li>– Some detergents</li> <li>– Phenol (2% for 15 minutes)</li> </ul> </li> <li>• Can survive up to 35 days in the environment in desiccated scabs</li> </ul> <small>Center for Food Security and Public Health Iowa State University - 2004</small> </div>	<p>LSD virus is susceptible to ether (20%), chloroform, formalin (1%) and some detergents (sodium dodecyl sulphate), as well as phenol (2% for 15 minutes). It can survive for long periods in the environment – up to 35 days in desiccated scabs.</p>
S l i d e  2 5	<div style="text-align: center;"> <h3>Control and Eradication</h3> <ul style="list-style-type: none"> <li>• Endemic areas           <ul style="list-style-type: none"> <li>– Vaccinate cattle</li> </ul> </li> <li>• Non-endemic areas           <ul style="list-style-type: none"> <li>– Keep free with import restrictions and proper quarantine</li> </ul> </li> <li>• Insect control</li> </ul> <small>Center for Food Security and Public Health Iowa State University - 2004</small> </div>	<p>In endemic areas, vaccinating cattle is the only viable means of control. The most likely way for LSD to enter a new area is by introduction of infected animals. Biting insects that have fed on infected cattle may travel and be blown for substantial distances. It is believed that LSD spread to Israel via contaminated insects that were blown across the Sinai Desert. The movement of contaminated hides represents another potential means for transmission.</p>

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### Control and Eradication

- Outbreak in LSD free area: Small scale
  - Quarantine, slaughter infected and exposed, clean and disinfect
  - Consider ring vaccination
- Outbreak in LSD free area: Large scale
  - Vaccination
  - Consider slaughter
- 1989: Israel
  - Quarantine, slaughter and ring vaccination

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In LSD free areas, it is important to not import cattle from an infected area without proper quarantine. If LSD occurs in an area usually free of the disease, quarantine, slaughter of infected and exposed cattle, cleaning and disinfection of premises, as well as, ring vaccination are recommended. If the disease has spread over a large area, the most effective means of controlling losses from LSD 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. In the Union of South Africa, the control of insects was not effective in preventing the spread of LSD but insecticides together with repellents aided in preventing the spread of LSD. Israel has been the only country to eliminate an incursion of LSD. The eradication was accomplished by quarantine, slaughter of the infected herd, and ring vaccination.

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### Vaccination

- Successful in endemic areas
- Neethling strain vaccine confers immunity up to 3 years
- Sheep and goat pox vaccine is used but may cause local, severe reaction

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In endemic areas, vaccination against LSD has been successfully practiced. In the Union of South Africa, an attenuated LSD vaccine is used. Vaccination with the Neethling strain confers immunity up to 3 years. In Kenya, sheep and goat pox virus vaccine is used. In Egypt, the Romanian strain of sheep and goat pox vaccine has been used successfully for prophylaxis against LSD. Sheep pox vaccine may cause local, sometimes severe, reactions and is not advised in countries that are free from sheep and goat pox.

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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

*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.*



## Acknowledgments

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