



CHAPTER 3.14

Lumpy skin disease

Fast facts

Lumpy skin disease (LSD) is a poxvirus disease of cattle, characterised by pyrexia, and nodules on the skin, mucous membranes and internal organs.

Organism

Lumpy skin disease virus (LSDV):

- closely related antigenically to sheepox virus and goatpox virus
- may remain viable in environment for prolonged periods.

Susceptible species

Cattle and water buffalo are the only livestock species affected by LSD.

Economic impact

There is potential for significant economic loss due to high morbidity and drop in milk yield in cattle, as well as restrictions on animal movements and international trade.

Epidemiology

- morbidity usually varies between 10 and 20 per cent
- mortality is usually negligible
- incubation period is usually 12 days, but may range from 4–28 days.

Transmission

Transmission occurs:

- mainly by arthropod vector (biting insects)
- less commonly by direct contact with skin lesions, saliva, nasal discharge, milk or semen of infected animals.

Clinical signs

Clinical signs include:

- sudden onset of pyrexia, reluctance to move, nasal and ocular discharges, hypersalivation and lymphadenopathy
- cutaneous nodules of 2–5 cm in diameter, particularly on the head, neck, limbs, udder, genitalia and perineum
- fibrinous plaques eventually form over the top of the larger nodules.

Post-mortem

Typical findings include:

- extensive greyish-pink skin nodules with caseous necrotic centres
- similar nodules may be found in the nasopharynx, trachea, bronchi, lungs, rumen, abomasum, renal cortex, testicles and uterus
- swollen, congested lymph nodes with petechial haemorrhages.

Samples

Collect:

- fresh tissue samples-skin lesion biopsies, scabs, vesicular fluid (if present) and lesions in the respiratory and gastrointestinal tracts
- skin scrapings
- whole blood in EDTA.

Actions to take

If you suspect a case of LSD:

- call the Emergency Animal Disease Watch Hotline (1800 675 888) immediately or contact a government veterinarian in your state or territory
- isolate suspected cases and implement biocontainment protocols (including farm movement controls) until advised by government veterinary authorities.

Introduction

Lumpy skin disease is a generalised viral disease of cattle that is spread by biting insects. The virus, which is closely related to the pox viruses of sheep and goats, causes nodular skin lesions on the animal's body. It can cause considerable production losses.

Disease agent and susceptible species

Lumpy skin disease is caused by lumpy skin disease virus (LSDV) which is a pox virus. LSDV:

- is an enveloped, double stranded DNA virus in the family *Poxviridae*, subfamily *Chordopoxvirinae*, genus *Capripoxvirus*
- is very closely related to sheep and goat pox
- infects all cattle (*Bos taurus* are more susceptible than *Bos indicus*) and water buffalo (*Bubalis bubalis*)
- can infect a number of wildlife species, including giraffe and impala; however, a wildlife reservoir has not been identified
- does not infect humans.

Distribution

Globally, LSDV:

- is endemic in Africa, being virtually throughout the entire continent, including Madagascar
- spread into the Middle East in the 1990s
- by 2013 spread to Turkey, and from there westwards into Europe including Greece, Russia, Serbia and Georgia

For the latest information on the distribution of LSD, refer to the WAHIS information database website of the World Organisation for Animal Health (OIE) [<http://www.oie.int>].

Occurrences in Australia

LSD has never been reported in Australia.

Epidemiology

Modes of transmission

Transmission occurs via:

- **vectors**—most commonly, insects (such as mosquitoes and biting flies) act as mechanical vectors of the virus
- **secretions and excretions**—less commonly, transmission can be through direct contact with secretions and excretions
- **semen**—shedding in the semen of clinically affected bulls may be prolonged; viral DNA has been found in the semen of some bulls for at least 5 months after infection, and live virus for up to 42 days; subclinically affected bulls may shed virus for at least 12 days.

Disease dynamics

LSDV:

- may be present in all secretions and excretions (including milk and semen) of infected animals. However, the level of virus shedding from mucosal surfaces is generally low
- is present at high concentrations in skin lesions
- may cause disease ranging from inapparent or mild to severe, depending on age, breed, immunity, and other factors
- the incubation period usually lasts 12 days, but may vary from 4–28 days
- would likely cause severe disease in Australian cattle populations (which are fully susceptible)
- skin nodules up to 5 cm or more in diameter develop within 1–2 days of the onset of pyrexia, especially around the head, neck, genitalia, limbs, udder and perineum
- although few adult cattle die from the disease, many become debilitated and can remain in extremely poor body condition for prolonged periods (up to 6 months or longer)
- has no carrier state and recovered animals develop lifelong immunity.

Persistence of the agent

Capripoxviruses are very stable in the environment and can remain viable for long periods, on or off the animal host. LSDV:

- can survive in necrotic skin nodules for up to 33 days or longer, in desiccated crusts for up to 35 days, and at least 18 days in air-dried hides
- in dark environmental conditions, such as contaminated animal sheds, can persist for many months
- is susceptible to sunlight and detergents containing lipid solvents and acids. Therefore, acids combined with detergents (such as Virkon[®]) are the disinfectants of choice, particularly for areas where organic matter is prevalent. Hypochlorites and aldehydes are useful for disinfecting clean surfaces. Citric acid, alcohols and iodophors are suitable for personal disinfection
- is inactivated after heating for 2 hours at 55°C.

Diagnosis and pathology

Clinical signs

Clinical signs include:

- may vary widely between individuals within the same herd
- nocular and nasal discharge and hypersalivation (usually observed first)
- a sudden onset of pyrexia, which may exceed 41°C
- sharp drop in milk yield
- highly characteristic, nodular skin lesions of 2–5 cm in diameter, particularly on the head, neck, limbs, udder, genitalia and perineum within 48 hours of onset of pyrexia. These nodules are circumscribed, firm, round and raised, and involve the skin, subcutaneous tissue and sometimes even the underlying muscles
- centres of large nodules may become necrotic and eventually fibrotic and persist for several months
- anorexia
- conjunctivitis

- enlarged superficial lymph nodes
- vesicles, erosions and ulcers may develop in the mucous membranes of the mouth and alimentary tract, and in the trachea and lungs
- acute respiratory distress, and in more severe cases, commonly secondary pneumonia, which can be fatal
- oedema of the limbs, brisket and genitals may occur
- abortion, intrauterine infections and temporary sterility of bulls and cows may also occur.

Pathology

In addition to the lesions described:

- nodular lesions may be scattered through the nasopharynx, trachea, bronchi, lungs and the gastrointestinal tract, including the rumen and abomasum, the renal cortex, testicles and uterus
- there may also be enlarged and haemorrhagic lymph nodes.

Differential diagnosis

Acute cases in naïve populations should be readily diagnosed based on clinical signs. However, clinical signs may vary widely between animals within the same herd some strains of low virulence may produce only mild clinical signs or subclinical disease. Consider in the differential diagnosis:

- exotic diseases
 - cutaneous tuberculosis
 - screw-worm fly myiasis
- endemic diseases
 - bovine herpes virus 2 (pseudo-lumpy skin disease)
 - bovine papular stomatitis
 - dermatophilosis
 - ectoparasites
 - pseudocowpox
- non-infectious causes
 - insect and tick bites
 - photosensitisation
 - skin allergies.

Samples required

Sample collection

Virus isolation will be possible within the first week of clinical signs developing, before neutralising antibodies develop. Collect:

- **serum** from at least 10 live, clinically affected animals, and from exposed animals (particularly those that are convalescent)
- **EDTA blood** from live, clinically affected animals (7–10 ml/animal)
- **fresh tissue**, characteristic skin lesions from skin as well as internal lesions if present, and regional lymph nodes (2 g of each tissue)
- **fixed tissue**, characteristic skin lesions from skin as well as internal lesions if present, and regional lymph nodes (in neutral-buffered formalin).

Transport of samples

For transport:

- chill blood samples and unpreserved tissue samples at either 4°C, or with frozen gel packs
- DO NOT FREEZE SAMPLES at -20°C; it reduces the sensitivity when used for virus isolation and molecular diagnostic tests
- place swab samples in virus transport media containing antibiotics and antifungals (or saline if other media is unavailable)
- send samples with dry ice if the journey is expected to take several days
- formalin fixed tissue can be sent at room temperature.

Sample submission

The relevant state or territory laboratory should coordinate sample packaging and consignment for delivery to CSIRO-AAHL.

Diagnostic tests

For LSD:

- a rapid, tentative laboratory diagnosis can be made by electron microscopy of tissue samples. Electron microscopic examination of tissue samples reveals typical capripoxvirus particles
- confirmation of the diagnosis is obtained by specifically identifying the virus in tissues from early lesions or in cell culture using virus-specific tests
- the most rapid, sensitive and specific diagnostic procedure is the detection of viral DNA in characteristic pox virus lesions or nasal swabs by real-time or conventional PCR. A positive result can be obtained within 1 day of samples being received at the laboratory.

Reporting requirements

LSD is an OIE-listed disease and Australia has an international obligation to report cases. If you suspect LSD, report the disease immediately by phoning the **Emergency Animal Disease Watch Hotline on 1800 675 888**, wherever you are in Australia. Alternatively, contact a government veterinarian in your state or territory.

Biocontainment and personal protective equipment

There are no public health implications for LSD, but you should implement biocontainment protocols until advised by government veterinary authorities. This includes isolating suspected cases and using and appropriately disposing of personal protective equipment such as gloves, coveralls and rubber boots (or disposable boots). Thoroughly disinfect and decontaminate clothing, vehicle and equipment before leaving the property.

Further information

Annandale CH, Irons PC, Bagla VP, Osuagwuh UI and Venter EH (2010). Sites of persistence of lumpy skin disease virus in the genital tract of experimentally infected bulls. *Reproduction in Domestic Animals* 45:250–255.

Babiuk, S, Bowden TR, Parkyn G, Dalman B, Manning L, Neufeld J, Embury-Hyatt C, Copps J and Boyle DB (2008). Quantification of lumpy skin disease virus following experimental infection in cattle. *Transboundary and Emerging Diseases* 55(7):299-307.

Irons PC, Tuppurainen ES and Venter EH (2005). Excretion of lumpy skin disease virus in bull semen. *Theriogenology* 63:1290-1297.

FIGURE 3.14.1 Disseminated cutaneous papules

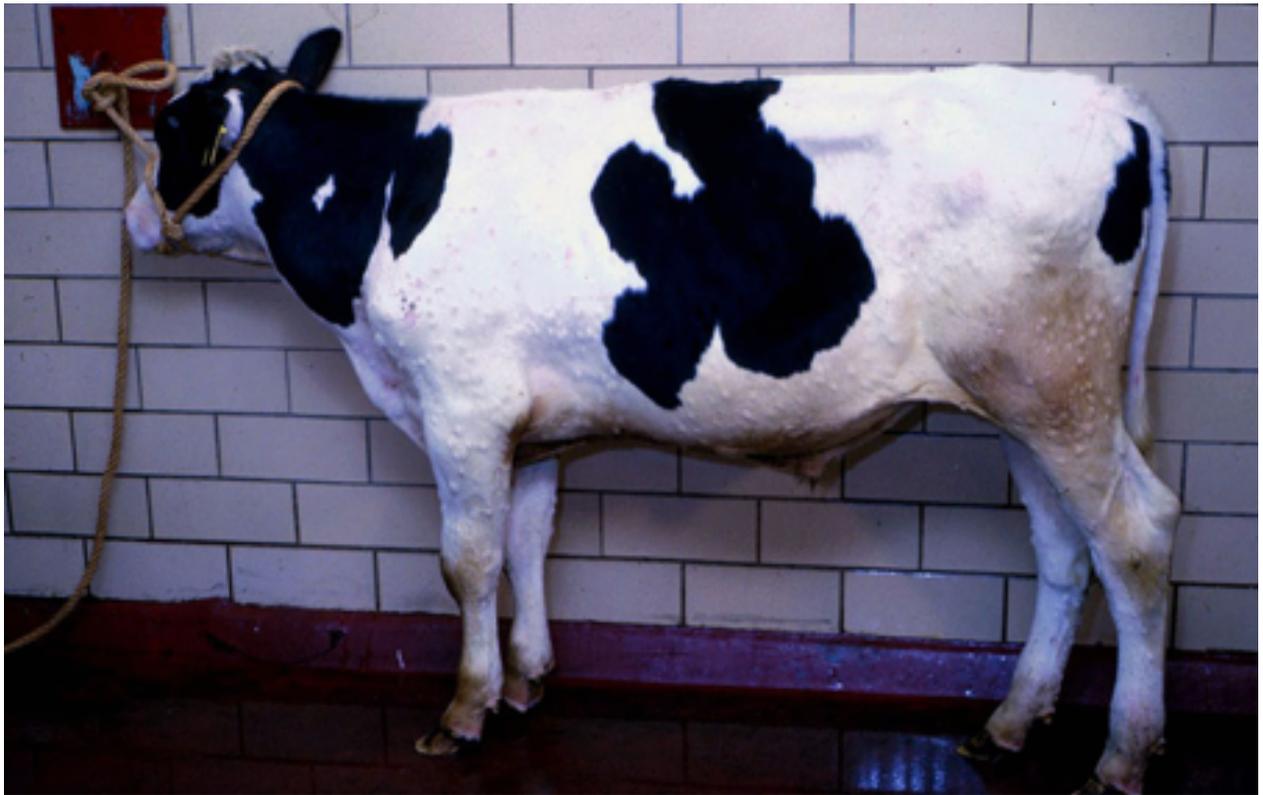


Image credit: PIADC and CFSPH

FIGURE 3.14.2 Disseminated cutaneous papules with necrotic centres



Image credit: PIADC and CFSPH

FIGURE 3.14.3 Sloughing of the necrotic centres of two cutaneous papules

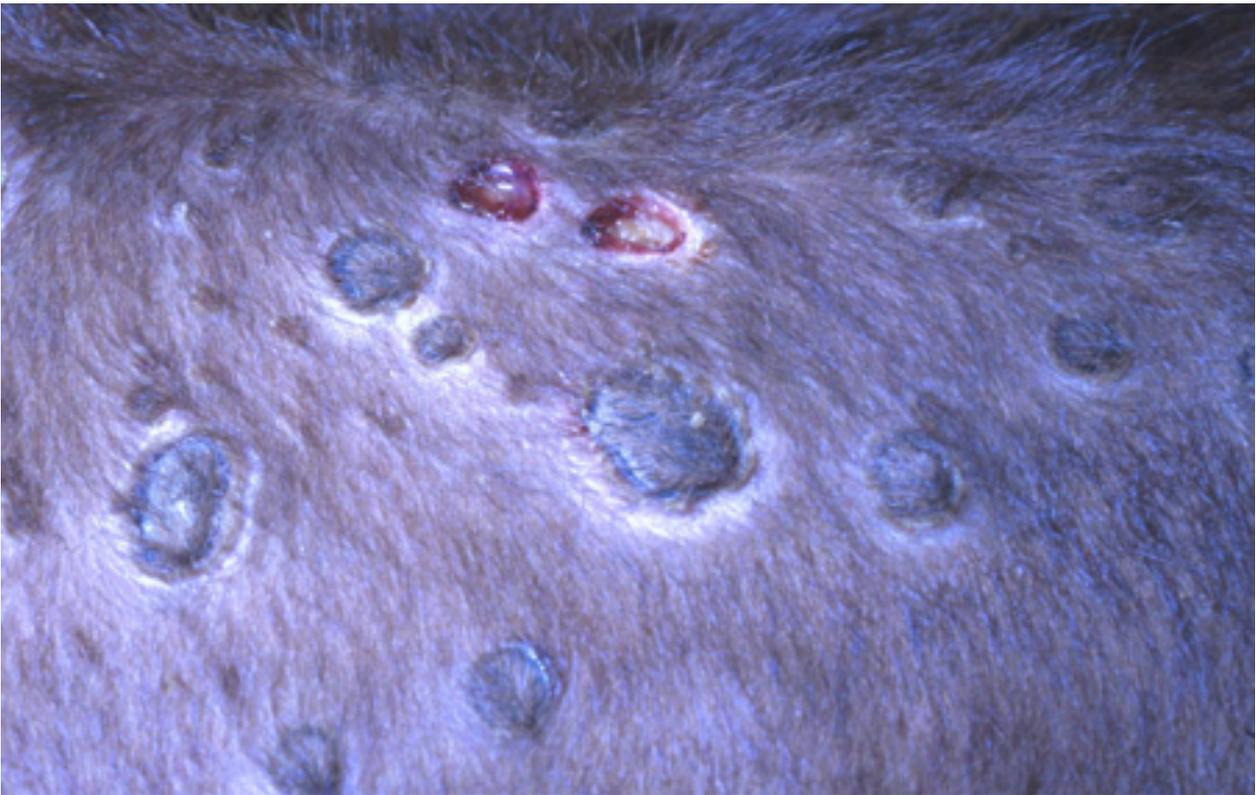


Image credit: PIADC and CFSPH

FIGURE 3.14.4 Haemorrhagic exudate associated with the necrotic centre of a cutaneous papule



Image credit: PIADC and CFSPH

FIGURE 3.14.5 Multiple sharply-demarcated slightly raised papules, with eroded surfaces, that extend into the nares



Image credit: PIADC and CFSPH

FIGURE 3.14.6 Marked generalised interlobular oedema of the lungs with a small cluster of red nodules on the left side of the specimen



Image credit: PIADC and CFSPH