

Comprehensive Clinical Assessment of Lumpy Skin Disease in Cattle

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Abstract

Lumpy skin disease (LSD) is an economically important viral disease of cattle caused by lumpy skin disease virus (LSDV), a member of the genus *Capripoxvirus* of the family *Poxviridae*. The disease is characterized by fever, depression, anorexia, lymphadenopathy, edema and the development of characteristic firm skin nodules that may progress to necrosis, ulceration and scab formation. LSD is transmitted predominantly through the mechanical transmission of virus by blood-feeding arthropods, including mosquitoes, biting flies and ticks, while animal movement and contaminated materials may contribute to its spread. The disease can cause substantial economic losses through reduced milk production, loss of body condition, hide damage, reproductive disturbances, secondary infections and increased treatment costs. Diagnosis is primarily based on characteristic clinical and epidemiological findings and can be confirmed through laboratory methods, particularly polymerase chain reaction (PCR). As no specific antiviral therapy is routinely available, treatment is mainly supportive and includes management of fever, pain and inflammation, wound care, nutritional and fluid support, control of ectoparasites and appropriate treatment of secondary bacterial infections. Effective prevention and control depend on early detection, isolation of affected animals, restriction of animal movement, strict biosecurity, vector control and vaccination of susceptible cattle. An integrated approach combining clinical surveillance, laboratory diagnosis, supportive treatment and preventive measures is essential for reducing disease transmission, improving animal welfare, minimizing production losses and strengthening the overall control of LSD in cattle populations.

Lumpy skin disease (LSD) is an economically important viral disease of cattle caused by lumpy skin disease virus (LSDV), a member of the genus *Capripoxvirus* within the family *Poxviridae*. The disease is characterized by fever, generalized skin nodules, lymphadenopathy, edema, nasal and ocular discharge, reduced appetite and decreased productivity, with severe cases potentially resulting in secondary infections, reproductive problems and mortality. Transmission occurs mainly through mechanical vectors such as mosquitoes, biting flies and ticks, while animal movement and favourable climatic conditions can facilitate disease spread. Diagnosis is based on characteristic clinical signs and epidemiological history and can be confirmed using laboratory techniques, particularly PCR.

As no specific antiviral treatment is routinely available, management primarily involves supportive therapy, wound care, control of pain and inflammation, treatment of secondary bacterial infections when indicated and maintenance of adequate nutrition and hydration. Effective control requires early detection, isolation of affected animals, vector control, strict biosecurity, movement management and vaccination. A comprehensive approach integrating clinical assessment, laboratory diagnosis, appropriate treatment and preventive measures is therefore essential for reducing morbidity, limiting transmission and minimizing the economic impact of LSD in cattle populations.

Etiology

Lumpy skin disease (LSD) is caused

by Lumpy Skin Disease Virus (LSDV), a large, double-stranded DNA virus belonging to the genus *Capripoxvirus* of the family *Poxviridae*. LSDV is closely related antigenically and genetically to other capripoxviruses, particularly sheep pox virus and goat pox virus. The virus primarily infects cattle and causes a systemic disease characterized by fever, lymphadenopathy and characteristic cutaneous nodules. Transmission occurs mainly through the mechanical transfer of virus by blood-feeding arthropods, including mosquitoes, stable flies and ticks, although direct and indirect transmission through contaminated materials and close animal contact may also contribute. Viral replication occurs predominantly in epithelial cells and other tissues, leading to inflammation, vascular damage, edema and necrosis that ultimately produce the characteristic skin lesions. The severity and spread of infection are influenced by host susceptibility, vector abundance, environmental conditions, animal density and immune status.

Transmission

Lumpy skin disease (LSD) is transmitted primarily through mechanical transmission by blood-feeding arthropod vectors, including mosquitoes, biting flies and ticks, which acquire the virus from infected cattle and transfer it to susceptible animals during subsequent feeding. Transmission is facilitated by high vector abundance, warm and humid environmental conditions, animal congregation and movement of infected cattle. The virus may also spread through direct contact with infected animals and indirectly through contaminated equipment, fomites, feed, water or veterinary materials, although these routes are considered less important than vector-borne transmission. Infected animals develop high viral loads in skin lesions and scabs, which serve as important sources of infection for vectors. Consequently, effective control of LSD requires reduction of vector populations, isolation of affected cattle, proper disinfection of equipment and premises and restriction of animal movement during outbreaks.

Pathogenesis

Lumpy skin disease virus (LSDV) enters the susceptible cattle mainly through the skin following the bite of infected blood-feeding arthropods and initially replicates at

the site of inoculation. The virus then spreads through local lymphatic vessels to regional lymph nodes, where further viral replication occurs, followed by viraemia and dissemination to multiple organs and tissues. Viral replication in endothelial cells and epithelial tissues results in vascular injury, inflammation, edema and tissue necrosis. The characteristic skin nodules develop due to viral replication and inflammatory reactions involving the dermis, subcutaneous tissues and associated lymphatic vessels. Necrosis within the nodules may lead to formation of firm lesions that subsequently become demarcated, ulcerated and covered by scabs. Enlargement of regional and superficial lymph nodes occurs as a result of viral replication and inflammatory responses. In severe infections, systemic dissemination may produce lesions in the respiratory and gastrointestinal tracts, resulting in respiratory distress, nasal discharge, anorexia and other systemic manifestations. Secondary bacterial infection of damaged skin and subcutaneous tissues may further aggravate the disease, delay healing and contribute to complications such as myiasis, edema and prolonged loss of productivity.

Clinical signs

The clinical signs of lumpy skin disease (LSD) vary from mild to severe and are generally characterized by fever, depression, anorexia and the development of characteristic skin nodules. Affected cattle may initially develop high fever followed by firm, well-circumscribed nodules of varying size over the head, neck, shoulders, trunk, udder, genital region and limbs. The nodules may involve the skin, subcutaneous tissues and associated lymph nodes and can subsequently undergo necrosis, ulceration and scab formation. Peripheral lymphadenopathy, edema of the limbs and brisket, nasal and ocular discharge, excessive salivation and lacrimation may also occur. In severe cases, respiratory distress may develop due to lesions involving the respiratory tract, while lesions of the oral and gastrointestinal mucosa may cause difficulty in eating and reduced feed intake. Udder involvement can result in mastitis and a marked decline in milk production. Reproductive disturbances, including temporary infertility, abortion and reduced conception rates, may occur in affected animals. Secondary bacterial infections,

myiasis, prolonged wound healing and severe debilitation can further complicate the disease, resulting in substantial production losses and delayed recovery.

Treatment

There is currently no specific antiviral treatment routinely available for lumpy skin disease (LSD); therefore, management is mainly supportive and directed toward reducing clinical signs, preventing complications and promoting recovery. Affected cattle should be isolated and provided with adequate rest, clean water and easily digestible, nutritious feed. Antipyretic, analgesic and anti-inflammatory therapy may be used under veterinary supervision to control fever, pain and inflammation. Skin nodules and ulcers should be kept clean and treated with appropriate topical antiseptic or wound-healing preparations, while fly and other ectoparasite control is important to prevent further irritation, myiasis and mechanical transmission. Antibiotics should be administered only when secondary bacterial infections are suspected or confirmed, rather than for the viral infection itself. Fluid therapy and nutritional support may be required in severely affected or dehydrated animals. Complications such as mastitis, respiratory involvement, edema and secondary wound infections should be treated appropriately. Good nursing care, regular monitoring and early management of complications can reduce morbidity and improve recovery. At the herd level, treatment should be combined with isolation of affected animals, vector control, biosecurity, movement restriction and vaccination of susceptible cattle to limit further transmission.

Prevention and control

Prevention and control of lumpy skin disease (LSD) require an integrated approach combining *vaccination, early detection, isolation, vector control, biosecurity and movement management*. Vaccination of susceptible cattle is one of the most important measures for reducing the occurrence and severity of disease and should be carried out according to the vaccination programme recommended by veterinary authorities. Suspected and confirmed cases should be identified promptly and isolated from healthy animals to reduce opportunities for transmission. Movement of infected or exposed cattle should be restricted, particularly

during outbreaks. Effective vector control through reduction of mosquito and biting-fly breeding sites, appropriate insect-control measures and maintenance of clean animal housing can help reduce mechanical transmission. Equipment, vehicles, housing areas and veterinary instruments should be appropriately cleaned and disinfected and sharing of contaminated materials between animals should be avoided. Regular surveillance and clinical examination of cattle can facilitate early identification of new cases. Proper disposal of contaminated materials, good nutrition and general herd health management further improve resistance to disease. A coordinated programme involving livestock owners, veterinarians and animal-health authorities is essential for effective prevention, rapid outbreak response and reduction of the economic impact of LSD.