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A Review on Lumpy Skin Disease

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ABSTRACT

Lumpy skin disease (LSD) is a viral disease caused by the lumpy skin disease virus (LSDV), a member of Capripoxvirus genus of the Poxviridae family. It is commonly an arthropod-borne contagious illness, correspondingly the non-vector spreading through body discharge and infected fomites. The incubation period ranges from one to four weeks leading to viremia. A pronounced socio-economic collapse is driven by reduced quantity and quality of milk, udder infection, thinness, low quality hides, loss of draught power, abortion, infertility, limitation to meat ingestion, higher morbidity, etc. Animals of any age and gender are susceptible to the disease. The aim of this review is to summarize the latest developments in epidemiology, with a focus on transnational spread, etiology and transmission, clinical manifestations, disease diagnosis and treatment and also current understanding of the mode of transmission of LSDV and advances in vaccine types and detection methods, providing a background for further research into various aspects of LSDV in the future.

INTRODUCTION

This is an acute to chronic viral disease characterized by bovine skin modules it characterized by fever, cutaneous nodules and generalized lymphadenitis. Lumpy skin disease is caused by the virus family poxviride genus capripoxvirus. Serological tests Lumpy skin disease (LSD) has long been confined to sub-Saharan Africa. However, in recent decades has slowly invaded new territories, first spreading to the Middle East and Turkey, and since 2015 to most of the Balkans, Caucasus and the Russian Federation. control effort. The disease is having a dramatic impact on rural livelihoods that rely heavily on cattle, resulting in significant loss of income for affected farmers. The consequences are also devastating at the national level, as the emergence of the disease has caused severe trade restrictions: the risk of imminent transmission to neighboring countries is very high.[1]

Lumpy Skin Disease (LSD) is an eminently infectious viral illness that mostly affects cattle in the dairy sector. The disease was first reported in India in 2013, and since then, it has spread rapidly across the country, causing significant losses to the dairy industry.[2]

LSD is a non-zoonotic, vector borne and transboundary disease with limited host range and currently restricted to ruminants viz. cattle and water buffaloes. The arthropod vectors responsible for the disease spread include biting flies, mosquitoes and ticks (b). Natural infection of sheep and goats has not been reported even in close contact with infected cattle and buffaloes but skin lesions have been seen after experimental infection in sheep, goat, giraffe, Giant gazalles, impalas. [3]

In the current situation, veterinary services in affected and vulnerable countries in the Middle East and Europe are facing the disease for the first time. Therefore, official veterinarians, ranchers, and others along the value chain are not familiar with the disease, transmission routes, and available prevention and control options. This guide aims to fill those gaps, primarily as it relates to the first line of defense. is grateful to the global scientific community for its contributions to LSD research, as well as to the World Organization for Animal Health (OIE), the European Commission and the Council – Healthand Directorate General for Food Safety (DG SANTE), European Food Safety Agency (EFSA), European Hand, Foot and Mouth Disease Control Committee (EuFMD), International Atomic Energy Agency (IAEA) and National and International Reference Institutes. Finally, we would like to thank all the countries who have recently been affected, shared their experiences, and supported us. Describe the best practices available to control and eradicate LSD.[4]

The recent spread of lumpy skin disease (LSD) into climatically new and previously disease-free regions underlines the importance of developing an in-depth understanding of the transmission mechanisms of the virus, contributing towards improved control and eradication of the disease. Effective containment of the recent spread of LSD virus (LSDV) within the Balkans showed that vaccination using live attenuated vaccines is safe, and it provides, by far, the best tool for LSD control. However, the use of live vaccines always has the risk, in the evolutionary perspective, that the vaccine virus may regain virulence by recombining with virulent field strains upon coinfection (Sprygin et al.,2018c), or the vaccine product itself may be contaminated during the production process by extraneous viruses that are harmful to cattle, such as pestiviruses. Thus, other supporting and safer methods to prevent the spread of the disease should be sought, warranting further studies such as ones to enable a thorough understanding of the different transmission routes.[5]

Capripoxviruses

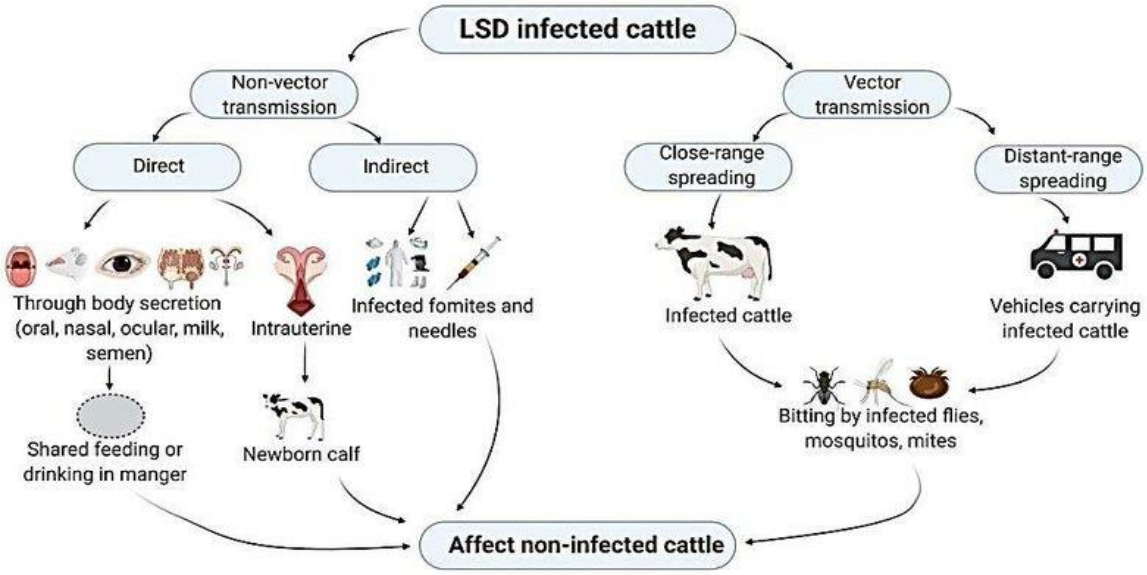
Introduction:

Family: Poxviridae.
Sub.Family: Chordopoxvirinae
Structure: Brick Shaped
Cpsid:Enveloped
Genomic Arragement: Linear
Genomic Segmentation: Monopartite

Capripoxvirus is a genus of viruses in the subfamily Chordopoxvirinae and the family Poxviridae. Capripoxviruses are among the most serious of all animal poxviruses. All CaPV are notifiable diseases to the OIE (World Organization for Animal Health). Sheep, goat, and cattle serve as natural hosts. These viruses cause negative economic consequences by damaging hides and wool and forcing the establishment of trade restrictions in response to an outbreak. The genus consists of three species: sheeppox virus (SPPV), goat pox virus (GTPV), and lumpy skin disease virus (LSDV). They share no serological relationship with camel pox, horse pox, or avian poxes. Capripoxviruses for sheeppox and goat pox infect only sheep and goat respectively. However, it is probable that North American relatives, the mountain goat and mountain sheep, may be susceptible to the strains but has not been experimentally proven. Lumpy skin disease virus affects primarily cattle, but studies have been shown that giraffes and impala are also susceptible to LSDV. Humans cannot be infected with Capripoxvirus.

Transmission of LSDV

The mechanism of LSDV transmission is useful in evaluating the epidemiology of the virus, thus contribute towards progressive control strategy and extinction of the disease[6]. An epitome of possible modes of transmission of LSDV is shown in Figure.



Non-vector transmission

Although ineffective, non-vectored LSD transmission happens when clinically afflicted animals meet contaminated materials, without the of biological or mechanical vectors. Infectious LSDV is excreted in saliva, nasal and ocular discharges, contaminating communal eating and drinking areas and spreading the disease [7,8,9]. Transmission through contaminated needles during vaccination, dispersion through infected semen during coitus, ingestion of milk, and intrauterine transmission may also act as a source of infection [10].

Vector transmission

The role of arthropod vectors in the transmission of this virus was experimentally confirmed. Several blood-sucking hard ticks, for instance, Rhipicephalusappendiculatus (brown ear tick), Rhipicephalusdecoloratus (blue tick), and Amblyommahebraeum, mosquito Aedesaegypti and flies Stomoxyscalcitran, Haematobiairritans and Muscadomestica have been implicated in the spreading of LSDV in sub-Saharan Africa. In the tick host, LSDV is trans-stadially and transovarially transmitted during cold temperatures.

The virus may spread in short distances of a few kilometers and even cover longer-distance due to unrestricted animal movements across international borders.[11]

LSD is manifested by prompt explosion of multiple circumscribed cutaneous nodules and accompanied by a febrile reaction. The spread of viral particles takes place through blood and form generalized lymphadenitis. Viremia occurs after the early febrile condition for almost 4 days. Following skin lesions due to the replication of the virus in certain cells such as fibroblasts, pericytes, and, endothelial cells of lymphatic and blood vessels lesions are produced in those sites. Histopathological changes in acute skin injuries include lymphangitis, vasculitis, thrombosis, infarction, edema and necrosis. Nodules might be found in subcutaneous tissues and muscle fascia. Neighboring tissue of epidermis, dermis, and core musculature reveal hemorrhages, congestion, and edema with distended lymph nodes. A special structure called ‘sit-fasts’ (necrotic cores detached from the adjacent skin) is usually seen indifferent parts of the body, which may ulcerate . The host immunological status exposes the lower rate of lymphocyte diffusion and phagocytic motion during the subsequent fourteen days of post infection [12].

Diagnosis

Other clinical signs include general malaise, ocular and nasal discharge, fever, and sudden decrease in milk production. Morbidity and mortality in the recent Eurasian epidemic has been approximately 10% and 1% respectively. The severity of disease in the 10% of affected cattle in the herd can vary from mild to fatal. Some cattle develop very small numbers of nodules which can be difficult to spot. Others develop innumerable nodules up to 3cm in diameter. The factors determining which cattle develop mild and which develop severe disease are unknown. Disease can be confirmed with a laboratory diagnosis, with tests available to detect the DNA of the virus or antibodies. LSD can be confused with many diseases, including: Pseulumpy skin disease (caused by Bovine Herpesvirus 2), Bovine papular stomatitis (Parapoxvirus), Pseudocowpox (Parapoxvirus), Cowpox, cutaneous tuberculosis, Demodicosis (Demodex), insect or tick bites, urticarial, photosensitisation, Papillomatosis (Fibropapillomas, "warts"), Rinderpest, Dermatophilosis, Besnoitiosis, Hypodermabovis infection and Oncocercosis. Signs such as fever and milk drop are non-specific, and can be seen with many other diseases. [13]

Laboratory diagnosis

Various Tests including Virus neutralization test, indirect fluorescence test, Agar gel immune diffusion test, ELISA and the Western blot test are used. Virus isolation Virus isolation is critical in the confirmation of clinical disease and determination of the isolate. This is the method used in the samples to test the virus's viability.

Prevention

1. A careful surveillance of the disease onset and spread is to be taken up at the farm level.

2. Purchase of new animals that are either incubating the disease or are viraemic without exhibiting any symptoms presents a major risk of introducing the disease into a herd. Introduction of new animals into herds should therefore be limited. The stock should be bought only from trusted sources. New animals should be examined and declared free of clinical signs prior to movement and on arrival, and should be kept separated/quarantined from the herd for at least 28 days.

3. In affected villages, cattle herds should be kept separate from other herds by avoiding communal grazing.

4. Cattle should be treated regularly with insect repellents to minimize the risk of vector transmission of the disease. This measure cannot fully prevent transmission but may reduce the risk.

5. Limiting vector breeding sites such as standing water sources, slurry, and manure, and improving drainage in holdings are sustainable, affordable, and environmentally friendly ways of reducing the number of vectors on and around cattle.[14]

Vaccination

Homologous live attenuated virus vaccine (Neethling strain: immunity conferred lasts up to 3 years). Heterologous live attenuated virus vaccine (Sheep or goat pox vaccine, but may cause local, sometimes severe reactions). This vaccine is not advised in countries free from sheep and goat pox because the live vaccines could other provide a source of infection for the susceptible sheep and goat populations. There is no new generation recombinant capripox vaccines are commercially available.

Treatment

There is no treatment for the virus, so prevention by vaccination is the most effective means of control. Secondary infections in the skin may be treated with Non-Steroidal Anti-Inflammatories (NSAIDs) and also antibiotics (topical +/- injectable) when appropriate.

Treatment methods

The treatment is done on symptom basis. However, the secondary bacterial infections can be avoided by the use of antibiotics and supportive care. Anti-inflammatory drug is also given to reduce pain and to increase the appetite of the cattle.

Allopathic treatment

• Antiseptic with Herbal Spray

• Levamisole (immunomodulatory drug)

• Antihistamines 10ml daily for three days

• Antibiotics e.g., Amoxicillin at the dose of 3-4 gm total or 10-12 mg per kg body weight.

Herbal Treatment: Ethnos veterinary formulation: (For oral administrations)

First Preparation

Ingredients: (For one dose)

• Betel leaves-10 nos.; Black pepper-10g: Salt-10g

Preparation

• Blend to form a paste and mix with jaggery

• Feed the dose in small portions orally

• Feed one dose every three hours for the first day (Day 1)

• Feed three doses daily from the second day onwards for 2 weeks (Day 2 onwards)

Second preparation

Ingredients: (For 2 doses• Garlic-2 pearls

• Coriander- 10g

• Cumin-10• Tulsi-1 handful

• Dry cinnamon leaves-10g

• Black pepper-10g

• Betel leaves-5 no

• Shallots-2 bulbs

• Turmeric powder-10g

Chiratateaf powder- 30g

• Sweet Basil- 1 handful

• Neem leaves-1 handful

• Aeglemammal's (Bel) leaves handful

• Jaggery-100g

Preparation

• Feed the dose in small portions oral

• Feed one dose every three hours for the first day (Day 1) evening

Second

• Feed two doses daily in the morning and condition resolves (2 day onwards)

Third Preparation for external application (if there are wounds):

Ingredients

• Acalypha indicate leaves- 1 handful
• Garlic- 10 pearls
• Name leaves- 1 handful
• Coconut or Sesame oil- 500ml
• Turmeric powder- 20g: Mehandi leaves
• 1handful: Tulsi leaves- 1handful.

Preparation

• Blend all the ingredients thoroughly.
• Mix with 500ml coconut or sesame oil and boil and bring to cool.[12]

Conclusion

(LSD) is a generalized skin disease which is an infectious, eruptive, occasionally fatal disease of cattle caused by a virus associated with the Neethling poxvirus in the genus Capri poxvirus of the family Poxviridae. Lumpy skin disease is one of the most economically significant trans boundary, viral disease of domestic cattles and buffeloes. LSD is currently present in majority of African and middle eastern countries and it is newly reported in India, it becomes a serious threat to the entire bovine population in India. The diseases economic impact was mostly due to its high morbidity rate rather than its mortality rate. Better understanding and awareness for LSD are of almost necessity to tackle the production loss due to the disease in India. LSD can also lead to reduction in export of livestock and livestock products. The reasons behind the entry of LSD in India need to be investigated along with epidemiological random screening in different regions to access the actual disease prevalence.[15]

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