ISSN: 2583-8288
Technical Article
Published on: 09/03/2025

The Emerging Threat of Lumpy Skin Disease in India

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DOI:10.5281/Vettoday.14996076

Abstract

Cattle populations around the world are affected by a rapidly spreading viral disease known as Lumpy Skin Disease (LSD). LSD is a serious threat to the economy, productivity, and health of cattle worldwide. The epidemiology, reason for emerging, economic loss, and control strategies of LSD are all highlighted in this article.

Key words: Lumpy Skin Disease, Cattle, Emerging, Livestock, economic

Introduction

India has the world's largest livestock population, accounting for 15% of the global animal population. India has a total livestock population of 536.76 million. Livestock is a significant contributor to the Indian economy, accounting for 6.20% of overall GDP and 31.0% of total GDP in agriculture. In India, 2/3 of rural households rely on livestock for their livelihoods (Basic Animal Husbandry Statistics report, 2021). A significant part of agriculture is livestock, with a variety of livestock species providing the majority of farmers' income. Livestock production is the initiative of smallholders (marginal, small, and landless farmers), and these farmers possess more than 80% of all livestock species. Over 70% of the population in hilly and temperate regions depend on cattle as a source of income, either directly or indirectly. The livestock sector in north India is particularly livelihood-intensive, and livestock farming is a key component of the mixed farming system (Sati and Singh, 2010). A number of factors, including feed quality, environmental variations, and disease incidence affect the milk production of bovine. Any disease outbreak causes milk production to drop abruptly and can have a temporary or lasting impact on livestock. Lumpy Skin Disease (LSD) was the most common of these diseases, and it severely damaged the dairy sector in the northern Indian states (Akther *et al*., 2023).

Emerging diseases are those that are new to a region or host population have a rapidly increasing incidence and geographic range, and lack the diagnostic facility and management skills to be effectively controlled. Lumpy skin disease (LSD) is an emerging, transboundary, vector-borne, non-zoonotic, notifiable disease that mostly affects ruminants, such as cattle and water buffaloes. It is an infectious viral disease caused by Lumpy skin disease virus (LSDV) of *Capripoxvirus* genus, family *Poxviridae*. The LSD virus is the same as the goat pox virus (GPV) and sheep pox virus (SPV), despite their phyto-genetically different characteristics (Eltom *et al*., 2021). There are other names for this disease *viz.,* "LSD," "Pseudo-urticaria," "Neethling virus disease," "exanthema nodularis bovis," and "knopvelsiekte" (Ahmed *et al*., 2020). The disease is carried by arthropod vectors such as ticks, mosquitoes,

and biting flies. Although skin lesions have been observed following experimental infection in sheep, goats, giraffes, and impalas, natural infection of sheep and goats has not been documented, even in close proximity to sick cattle and buffaloes. LSD is associated with low mortality but high morbidity (Moda *et al*., 2024).

It is characterized by fever, enlargement of the lymph nodes, skin nodules and cause extreme emaciation, decreased milk production, and infertility. Fever, lymph node swelling, skin nodules that are confined and cause extreme emaciation, decreased milk production, and infertility are the disease's hallmarks. In general, it impacts the production of meat and milk, the quality of the hide, draft power, and the reproductive efficiency (abortion and infertility), all of which have an impact on the economic value of animal.

Epidemiology

The disease was first reported in Zambia, Africa (1929) then spread over the whole African continent. According to OIE, this disease is currently prevalent in European, Asian, and African countries. LSD has recently been reported from nations neighbouring India, such as China and Bangladesh. In India, first case was confirmed in Odisha in the month of August 2019, in monsoon season with high vector density and humidity. At this time, it appears that cattle with weakened immune systems are more susceptible to the disease. Since stray cattle are generally weaker and have low immunity, they provide a high-risk issue and are challenging to isolate. Across the nation, an extremely small number of buffaloes have contracted the disease. Compared to local native breeds, exotic and high-breed animals are more susceptible to the disease. It is spread by blood-sucking insects, including flies, mosquitoes, and ticks. LSD is highly host specific. It predominantly affects cows and to a lesser extent buffalo. Cattle have greater morbidity rates compared to buffalo. In cattle, it primarily affects calves and heifers, not adults. Although some LSDV strains may replicate in cattle and sheep, there is currently not much evidence to suggest that small ruminants serve as a reservoir for the virus (Haider *et al*., 2024).

Transmission

The virus spreads by unrestricted movement of animals, including stray animals. Infected animals release viruses in saliva, nasal, and ocular secretions. It can stay in saliva for up to 11 days after fever onset. The virus can remain in skin nodules even after 33 days of infection.

The virus spreads mostly through arthropod vectors such as biting flies (*Stomoxys* and *Biomjie*), mosquitos (*Aedes* and *Culex*), and ticks (*Rhiphicephalus appendiculatus* and *Ambylomma hebraem*). During the monsoon season, the disease spreads more quickly due to increased vector activity. The virus can spread through both natural and artificial insemination, as it remains in infected bulls' semen. It is recommended to use bulls after 22 days of intervals for mating. Disease can transfer from females to calves with skin nodules, and suckling calves can become infected by milk or skin nodules in their teat (Sprygin *et al*., 2019).

Why Emerging in India?

Extensive LSD outbreaks are typically caused by an increase in the number of naive animals, active blood-sucking vectors, and unrestrained animal movements. The primary cause is usually the introduction of new animals into or near a herd. Warm and humid climates can promote the spread of LSD due to the availability of vector populations. In poorly ventilated sheds in rural and urban dairies, as well as open grazing areas, a variety of blood-feeding arthropod vectors survive. The virus is not found in affected animals' meat, but it may be isolated from milk during fever. Intensive farming practice is one of the causes (Gupta *et al*., 2020 and Pal *et al*., 2024).

Economic Impact in India

The outbreak of the Lumpy skin disease had severe, widespread, and long-term consequences for the livestock industry. While the disease's impact on cattle and farmers can be rapidly assessed, proper quantification is challenging due to a lack of data. An animal disease outbreak's costs can be essentially broken down into two categories: direct loss, which includes milk loss, failure to reproduce, treatment costs, and preventive costs (vaccine, sanitization, vector control, *etc*.). But indirect losses include things like labour costs, disposal

costs, transportation costs, decreased selling value, and decreased drought power.

The state had seen a 15-20% decrease in milk output as a result of the LSD outbreak. In the first 15 days of illness, the affected animals' milk output dropped by 80%, and even after they recovered, it dropped by up to 50%, resulting in significant financial losses for the dairy farmers (depending on the severity of the disease). According to specialists, there may be no immediate influence on milk supply (since LSD hasn't been widely recorded in buffaloes); but production may remain low over the next 2-3 years because affected animals would not reproduce.

Local cattle had a lower per head death rate (owing to higher disease resistance) than Holstein-Friesian local cross cattle, who were significantly more sensitive to LSD. Because of their high yielding capability, HF crossbred immune status is constantly challenged, making them more susceptible to infection and, in severe cases, death. The expenditures include diagnostics, medication, and vaccinations, as well as extra labour for treating infected animals. Many herd owners in the region employed public veterinary services to vaccinate their animals against infectious and transboundary animal diseases such as LSD, which is free of charge. Treatment of sick animals is also a significant contributor to disease economics (Singh *et al*., 2023).

Control

LSD control is based on:

1) Vaccination of susceptible populations with >80% coverage
2) Movement control and quarantine of cattle and buffalo
3) Biosecurity and vector control
4) Strengthening active and passive surveillance
5) Raising risk mitigation awareness among all stakeholders involved; and
6) Zoning - large protection and surveillance zones as well as vaccination zones

(Haider *et al*., 2024)

Immunizing cattle on a large scale and restricting animal movement are effective measures for disease management. Live attenuated LSDV vaccines offer adequate protection in cattle with 80% immunization coverage. To effectively control the disease, vaccine coverage should be between 80-100%. The antigen of LSD virus is similar to goat and sheep pox virus; hence a goat pox vaccination has been tested on cattle in the country. Animals within 5-6 kilometres from an infectious region need to get vaccination (Kumar *et al*., 2023 and Reddy *et al*., 2024)). All animals above four months old, including small calves and pregnant cows, should be vaccinated with goat pox vaccine @ 3 mL SC.

In September 2022, Biovet Pvt. Ltd. in Karnataka received the homologous live-attenuated LSD vaccine "Lumpi-ProVacind" technology, developed by scientists at ICAR-NRC on Equines and ICAR-Indian Veterinary Research Institute, Izatnagar (IVRI), for commercialization. Lumpi-ProVacind is safe in animals and promotes LSDV-specific antibody and cell-mediated immune responses, while also giving complete protection against lethal LSDV challenge. Lumpi-ProVacind is a preventive vaccine against LSD for animals (Kumar *et al*., 2023).

Conclusion

LSD poses a significant and dynamic challenge to India's livestock sector. Addressing this threat involves ongoing surveillance, study, and the adoption of comprehensive measures to reduce its impact. Adopting a protective and coordinated approach can lessen the economic and animal health effects caused by LSD and preserve the long-term sustainability of India's livestock sector.

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