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Review Article

Lumpy Skin Disease: A Review

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Abstract:
In India, a newly emerging viral disease known as lumpy skin disease (LSD) affects cattle and buffalo. Arthropods (mosquitoes, biting flies, Culi-coides midges, and three blood-sucking hard ticks) that operate as mechanical vectors are the primary means of disease transmission. Skin nodules all over the body, fever, lacrimal discharge, nasal discharge, anorexia, decreased milk yield, emaciation, sadness, and unwillingness to move are some of the most significant clinical symptoms. Since the first discovery of lumpy skin disease in India, the condition has been swiftly spreading throughout the nation, posing a potential threat to the production and survival of the cow and buffalo populations.
Through the Middle East, lumpy skin disease of cattle (LSD) has since spread outside of Africa. It is now threatening to become a worldwide pandemic, with india possibly next in its path.
Keyword: LSDV, emerging, transmission, productivity, lumpy pandemic

Introduction

- A major infectious transboundary infection affecting cattle and buffalo of all breeds and age groups is lumpy skin disease (LSD).
- This newly discovered viral virus has significant global economic implications. LSD is also known as neethling virus disease, pseudo urticaria, exanthema nodularis bovis, and Knopvelsiekte.
- It damages skin from temporarily too permanently and is distinguished by distinctive nodular lesions, which lowers the value of hides for sale (Amenu et al., 2018; Feyisa, 2018).
- In addition, LSD significantly harms farmers through chronic debility, decreased milk production, slow growth, infertility, abortion, and even death (Babiuk et al., 2008; Abutarbush et al., 2013).
- According to the 20th Livestock Census, there are 192.49 million cattle and 109.85 million buffalo in India overall. The majority of Indians work directly in the dairy business. The rapid expansion of lumpy skin disease in India, which has recently been documented, Current

article addresses LSD in length in this context, along with potential preventative and control strategies to offset production losses.

Figure: Infected cow with lumpy skin disease

Pathogenesis

- The Lumpy Skin Disease (LSD) virus infects the host through the skin or the mucosa of the gastrointestinal system, causing viraemia and two-week-long fever responses. The virus causes lymphadenitis when it enters the local lymph nodes. According to Vorster and Mapham (2008), the virus develops inflammatory nodules on the skin as a result of its rapid reproduction in certain cells, such as endothelial cells of lymphatic and blood artery walls.
- The condition is a generalised epitheliotrophic disease that causes localised and systemic reactions that lead to lymphadenitis, vasculitis, and edoema as well as necrosis. Thrombosis and infarction may be seen in some severe cases. Skin nodules can have caseous necrotic centres and turn grey-pink. 'Sit-fasts' are circumscribed necrotic lesions that have the potential to ulcerate.
- Lymph nodes are enlarged and secondary bacterial infections are common in the narcotics cores . multiply virus-encoded factors are produced during infection , which influence pathogenesis and disease (Tuppurainen et al., 2017)

Causative Agent

The lumpy skin disease virus (LSDV), a member of the genus Capripoxvirus (CaPV) under the family Poxviridae, is the culprit behind lumpy skin disease. The sheep pox virus (SPPV) and goat pox virus (GTPV), which are closely related but phylogenetically distinct, and the lumpy skin disease virus share the same genus. LSD, SPP, and GTP viruses have serological cross-reactions, thus there is only one serological type of LSDV. The huge, double-stranded DNA virus has very little genetic diversity and is highly stable. As a result, unlike other TADs, like foot-and-mouth, LSDV's farm-to-farm dissemination cannot be tracked by sequencing the virus isolates disease (FMD).

Transmission

- It suggests there had been airborne movement of biting insects. According to a study looking at the risk factors for the spread of LSD in Ethiopia, the disease is more common where there is a warm, humid agro-climate that supports an abundant vector population.
- Additionally, it was demonstrated that while movements of cattle were not linked to the development of the disease, husbandry practises like shared grazing and watering areas and the addition of new animals to a herd were.

His argument is that imposing quarantines alone won't stop the spread of the LSD virus since vectors' airborne flight can greatly exacerbate the breakout.

- The primary infection source for healthy animals is given that the virus continues to exist in the skin lesions or nodules long-lasting lesions or scabs and a significant affinity for cutaneous tissues The virus is also expelled by the nose, blood, and saliva, milk, semen, and lachrymal secretions of infected animals (transmissible to nursing calves), which could infect other susceptible cattle.
- Nodules that develop on the mucous membranes of the mouth, udder, rectum, and genitalia also ulcerate and can act as sources of infections. Animals that are viraemic play a key role as a source of infection, particularly when that infection might linger for up to two weeks.
- Consequently, blood-feeding arthropods including biting flies, mosquitoes, and ticks can transmit the virus to hosts by biting them. Though it happens seldom, transmission can also spread through direct touch with tainted food and drink.

Latrogenic transmission or spread can also happen when numerous animals are being vaccinated at once with a single syringe and needle. In this scenario, the needle may pick up the virus from crusts and other skin lesions and inject it into animals with healthy immune systems.

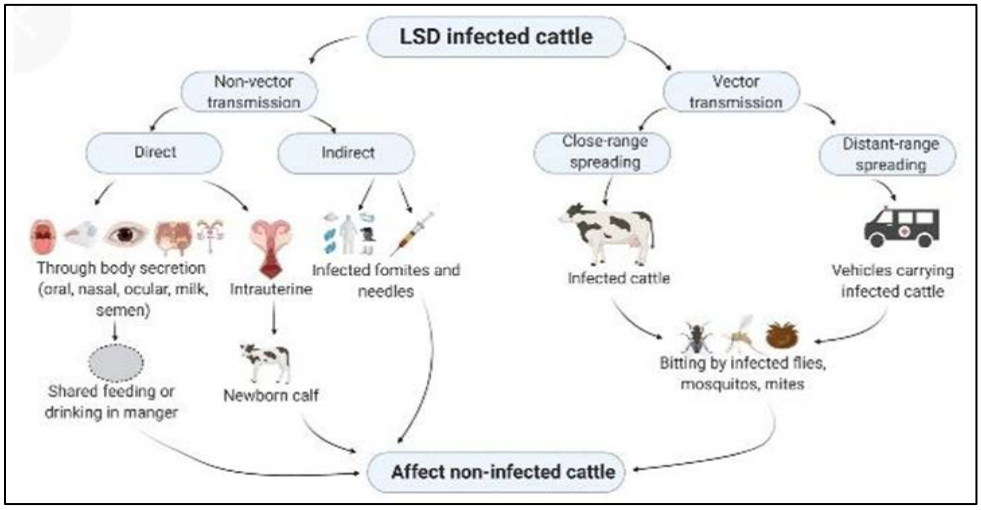
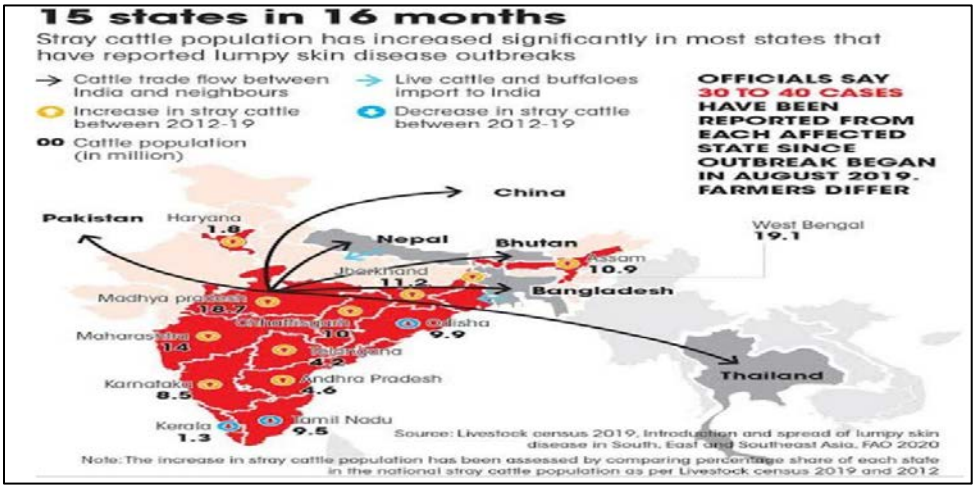


Figure: Spreading of LSD



Producers of lumpy skin disease vaccines

Type of vaccine	Virus strain	Producer
Attenuated LSDV vaccines		
Onderstepoort Biological Products Lumpy skin disease vaccine for cattle	LSDV Neethling strain	OBP, South Africa
MSD Animal Health Lumpyvax	LSDV Neethling strain	MSD, Animal Health, South Africa
BOVIVAX LSD	LSDV Neethling strain	MCI Santé Animale, Morocco
Herbivac LS	LSDV Neethling strain	Deltamune, South Africa
LSD-NDOLL	LSDV Neethling strain	Dollvet, Turkey
Lumpyvac™	LSDV Neethling strain	Vetal Animal Health Products S.A., Turkey
Attenuated SPPV vaccines		
Jovivac	Sheeppox virus strain RM-65	JOVAC, Jordan
Attenuated GTPV vaccine		
Caprivac Freeze dried live attenuated Goatpox Virus strain Gorgan vaccine.	Goatpox virus strain Gorgan	JOVAC, Jordan
Potential attenuated GTPV vaccine		
Goat Pox Vaccine*	Goatpox virus, live, Uttarkashi strain	Hester, India

* Goatpox virus Uttarkashi strain vaccine needs to be validated to confirm it provides the same protection against LSD as the LSDV vaccines.

Virus Detection (Basic Diagnostic Test)

- The use of a special hyperimmune serum against LSDV, LSDV was discovered using the usual polymerase chain reaction (PCR), real-time PCR (RT-PCR), and fluorescent antibody technique (FAT).
- Indirect FAT (IFAT) and indirect enzyme-linked immunosorbent test were used to evaluate cattle serum (ELISA). For the quick, accurate, and reliable identification of LSDV in blood and skin nodule biopsies of suspicious cattle, use the RT-PCR assay.
- The objective of the current study was to use quick serological and molecular diagnostic assays to identify LSDV in infected cattle specimens in several Egyptian Governorates.

Discussion

- Since no definitive evidence has yet been found regarding the prevailing mechanism, applicable to actual field settings in both tropical and northern climes, the problem of LSDV transmission has proven perplexing in many ways.
- Early research on the propagation of the LSDV came to the conclusion that only intravenous inoculation mimicking an insect bite may cause generalised infection, and that touch transmission is ineffective and cannot explain the virus's recent rapid spread in a northerly and then easterly direction. Experimental evidence has also implicated a number of hard tick species, but these are most likely only responsible for localised dissemination.
- The stable fly (Stomoxys calcitrans) and Culi-coides midges are the most likely blood-sucking vectors for natural virus transmission, according to experimental work using laboratory-reared arthropods and mathematical modelling; however, testing of field-caught specimens, including species like horse flies, during outbreaks has not yet provided conclusive confirmation.
- Field-isolated recombinant LSDVs with altered genotypic and phenotypic characteristics exhibit novel features enabling transmission from animal to animal without a dependency on insects, whereas attempts to achieve LSDV infection by classical field strains without using blood-sucking arthropods have been unsuccessful.

Clinical Signs and Symptoms

- Firm raised skin nodules up to 50mm in diameter develop around the head, neck, genitals and limbs.
- Nodules can develop on any part of the body.

Scabs develop in the centre of the nodules after which the scabs fall off, leaving large holes that may become infected

- Swelling of limbs, brisket and genitals may occur
- Reluctance to move and eat .
- Nasal and ocular discharges .
- Enlarged superficial lymph nodes
- Drop in milk production .
- Abortion .
- Some animals with the disease may be asymptomatic (have the disease but not show signs)

Figure: Nasal and ocular discharges

Figure: Nodules and scabs on cattle body

Treatment and prevention

- There is currently no specific treatment for LSD because it is a viral illness. Animals with the infection are, however, given antibiotics to stop further bacterial invasion and other supportive drugs to lessen the clinical symptoms.
- To stop flies and bacterial infection, it is also advised to apply an antiseptic locally to the skin. Depending on the severity of the illness, antibiotics such as penicillins, cephalosporins, tetracyclines, and fluroquinolones are recommended for 5 to 7 days.
- Antihistaminic and non-steroidal anti-inflammatory medication administration is also recommended. To reduce fever, an antipyretic medication such paracetamol is administered. Regular administration of multivitamins and liver supporting medications is necessary for anorexia recovery.

Prevention

Cattle movement control

When a disease is first discovered in a country or region, standstill and quarantine are the first urgent actions to be implemented. This also holds true for high-risk regions near neighbouring nations that report LSD use. Zones with restrictions on movement kept as low as possible, and clinical surveillance should be instituted in high-risk areas.

Vector Control

Vector control should be viewed as a supportive measure rather than a preventative one since it cannot stop LSD from spreading or

becoming infected. Regular application of pour-on insect repellents and insecticides for cattle and buffaloes along with other pest control methods can help control vectors farm buildings and grounds.

Vaccination

The best method for preventing the spread of LSD is vaccination of cattle using a vaccine that has been shown to be effective, particularly if pre-emptive, or applied before the virus enters a region or nation at risk. However, preventing LSD use through immunization result in trade restriction on the export of live cattle and their products.

Awareness

Efficient disease control is impossible without good cooperation among farmers and other cattle value chain actors. Awareness campaigns should be targeted at official and private veterinarians, both in the field and in abattoirs, among veterinary students, farmers, herd-ers, cattle traders, cattle truck drivers and artificial inseminators.

Conclusion

- Until recently, sub-Saharan Africa was the sole region affected by the vector-borne disease lumpy skin disease (LSD), which is caused by the genus CaPV.
- However, it has started quietly encroaching into new lands lately, including Europe. Clinically, the disease is distinguished by distinctive nodular lesions, which primarily affect animals' skin and underlying tissues. Occasionally, other parts of the body, such as the conjunctiva, alimentary, respiratory, and urogenital tracts, may also be affected.
- Due to decreased hide quality, chronic debility, decreased milk output, weight loss, infertility, miscarriage, and death, lesions therefore cause enormous economic losses. Additionally, they could have a profound impact on rural lives that are heavily dependent on cattle, leading to large production losses. Since the disease's presence has led to tight trade restrictions, its effects are likewise catastrophic at the national level.

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