

# Overview on Lumpy Disease: Pathogenesis, Sign And Symptoms, Risk Factor and Treatment

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## ABSTRACT:

The lumpy diseases is an infectious disease. It is caused by viruses (LSDV) of the family Capripoxvirus. An investigation on the risk variables linked to the proliferation of LSD in Ethiopia has been conducted through a cross-sectional questionnaire-based study. LSD virus, virus has been detected in stomoxys calcitrans and Anopheles stephensi. Virus can survive in necrotic skin for about 33 days and remains viable for at least 18 days in air-dried skin lesions at room temperature. The virus has been reported to persist in necrotic skin nodules for up to 33 days or longer, in dried crusts for up to 35 days and at least 18 days in air-dried hides. LSD has gross lesions that are well-described. Skin nodules are typically elevated, hard, and spherical in shape, however some might fuse together to form enormous, uneven plaques with defined boundaries. Biphase fever, a clinical symptom of LSD, is characterised by two episodes of fever that develop after a varying incubation period of 4–12 days (typically 7 days). The affected animals' body temperature rises to 40–41.5°C, and this can last for at least 6–72 hours and, in exceptional cases, up to 10 days. To guarantee sufficient defence against LSD, susceptible adult cattle should receive a yearly vaccination. To reduce the possibility of the disease spreading by vectors, cattle should get routine treatments with insect repellents. While not completely effective, this method can lower the likelihood of transmission. The first report of LSD's clinical symptoms was published in Zambia (Morris 1931). The affected animals displayed symptoms of nasal discharge, emaciation, necrotic plaques in the mouth and nose mucous membranes, and excessive salivation. The most popular technique for diagnosis is full-thickness skin biopsies or scabs with electron microscopy showing the presence of characteristic capripox virions. To identify the antigens, techniques such as ELISA, PCR, and viral neutralization test procedures are helpful. Doctors may administer vitamin injections, anti-inflammatory drugs, or antibiotics to treat secondary bacterial infection fever and inflammation. A full recuperation period of six months A27L, L1R, and a combination of the two LSDV antigens were included in the development of three vaccines. Insect repellents, disinfectant cleaning, proper disposal of contaminated areas, and awareness-raising are examples of preventive approaches. The economic impact of LSD was caused by both direct consequences, like control expenses, and indirect ones, including milk loss, mortality loss, and draft power loss.

**KEYWORDS:** lumpy disease, LSDV, Capripoxvirus.

## INTRODUCTION

severe concern to stockbreeding, lumpy skin disease (LSD) can cause acute or subacute disease in water buffalo and cattle. Cattle of all ages and types are impacted, although young animals and those nearing the end of lactation are particularly vulnerable. (1) Skin disease (LSD, pseudourticaria, Neethling virus disease, exanthema nodularis bovis and knopvelsiekte) is an infectious disease. It is caused by viruses (LSDV) of the family Capripoxvirus. (2) Lumpy skin disease causes reduced milk production and sometimes death from secondary bacterial infections (3) LSD, an economically important transboundary disease of cattle, is transmitted by arthropod vectors. (4) Cattle's lumpy skin disease is a viral disease that transmits by blood-feeding insects like mosquitoes. The livestock sector globally is highly dynamic, contributes 40 % of the global value of agricultural output, and supports the livelihoods and food security of almost a billion people. (5) Symptoms of LSD in livestock vary from mild to severe; characterized by fever, numerous skin nodules covering the neck, back, peritoneum, tail, limbs and genitals, mucous membranes; the damage can also involve the subcutaneous tissues and sometimes the muscles and internal organs. affected animals also have lameness, weight loss and stop producing milk. (6) Incursion of LSD was reported for the first time in Turkey and Iraq in 2013, indicating that the disease has a potential for further spread to the European Union and Caucasus Region, as well as to Asia. (7) Currently, it is widely accepted that LSD is transmitted mechanically by blood-feeding insects such as mosquitoes and stable flies (8)

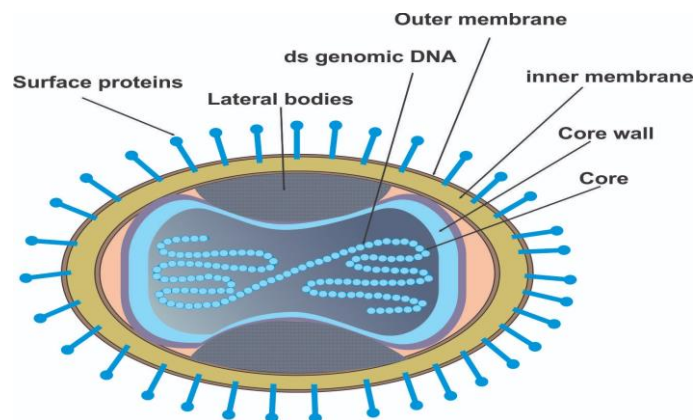


Fig no .1 Lumpy skin disease virus (LSDV)

## HISTORY OF LUMPY SKIN DISEASE:-

In 1929, in what was then Northern Rhodesia, Zambia published the first account of the clinical symptoms of LSD (Morris 1931). Initially, LSD symptoms were thought to be the result of poisoning or an extreme sensitivity. (9) In 1957, in East Africa (Kenya), in 1972, in Sudan, and in 1974, in West Africa, LSD was discovered and diagnosed. Zimbabwe, Somalia, Tanzania, Kenya, and the Cameroon also reported an LSD epidemics that occurred between 1981 and 1986. (10) In Kahramanmaras, Turkey, an LSD outbreak was first documented in 2013. (11) lumpy skin disease in Taiwan in Kinmen Island on July 8, 2020. There are two kinds of bovine species affected by this disease (*Bos indicus* and *Bos Taurus*) and water buffalo. Several lumpy skin disease cases have reported outside of Africa: Indonesia in 2022; Russia in 2017; Thailand in 2021; Albania in 2016; Georgia in 2018; Greece, Macedonia, and Russia in 2017. (12) Bangladesh : Mid-July 2019 had the first outbreak in Asia, which affected 66 cattle in Chattogram and Chittagong, Bangladesh (Badhy et al., 2021). Nepal : 500 Jersey crossbred, Holstein

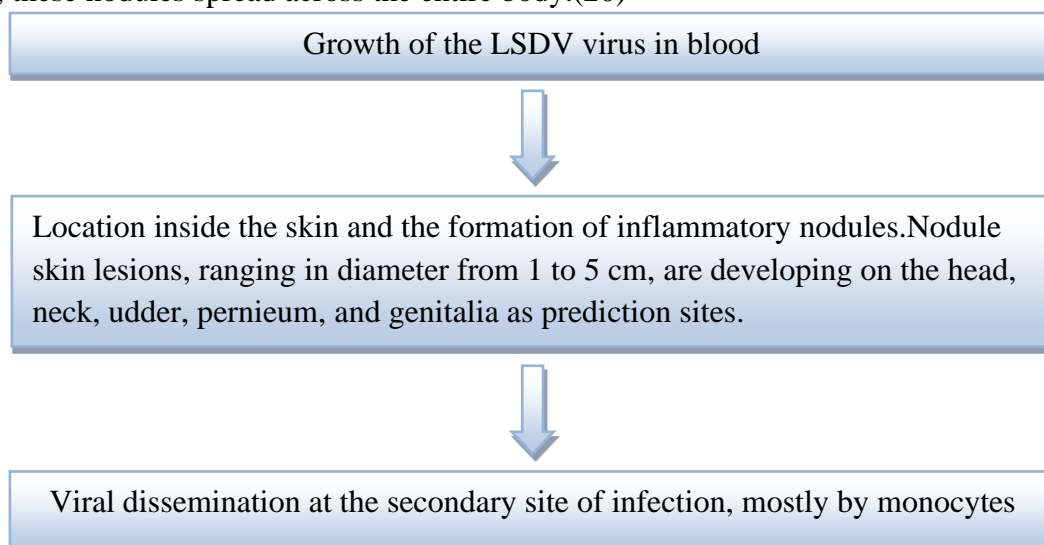
Friesian crossbred, and local cattle of various ages (4 months to 8 years old) were affected by the first Nepalese outbreak, which happened in the fourth week of June 2020 (Acharya and Subedi, 2020). Sri Lanka : 36 cattle are affected in the first week of September 2020 in Kopay Town, which is close to Jaffna City in the Northern Province.(13) As of right now, in India Gujarat is where the current outbreak originated, July, Rajasthan, and had extended to Punjab. Himachal Pradesh, the Andaman Islands, and Early August will see Uttarakhand. After that it reached Jammu. Kashmir, Haryana, Uttar Pradesh, and so forth. Lately weeks, reports in Madhya Pradesh and Maharashtra Jharkhand, Pradesh, aAfter that it reached Jammu. Kashmir, Haryana, Uttar Pradesh, and so forth. Lately weeks, reports in Madhya Pradesh and Maharashtra Jharkhand, Pradesh, and Delhi.(14) A total of 32 smallholder farmers' 154 oxen, 34 cows, 13 bos indicus calves, and two Asian water buffalo (Bubalus bubalis) cows were found to have lumpy skin disease (LSD). villages in Madhya Pradesh, central India, near the tiger sanctuaries of Kanha and Bandhavgarh.(15)

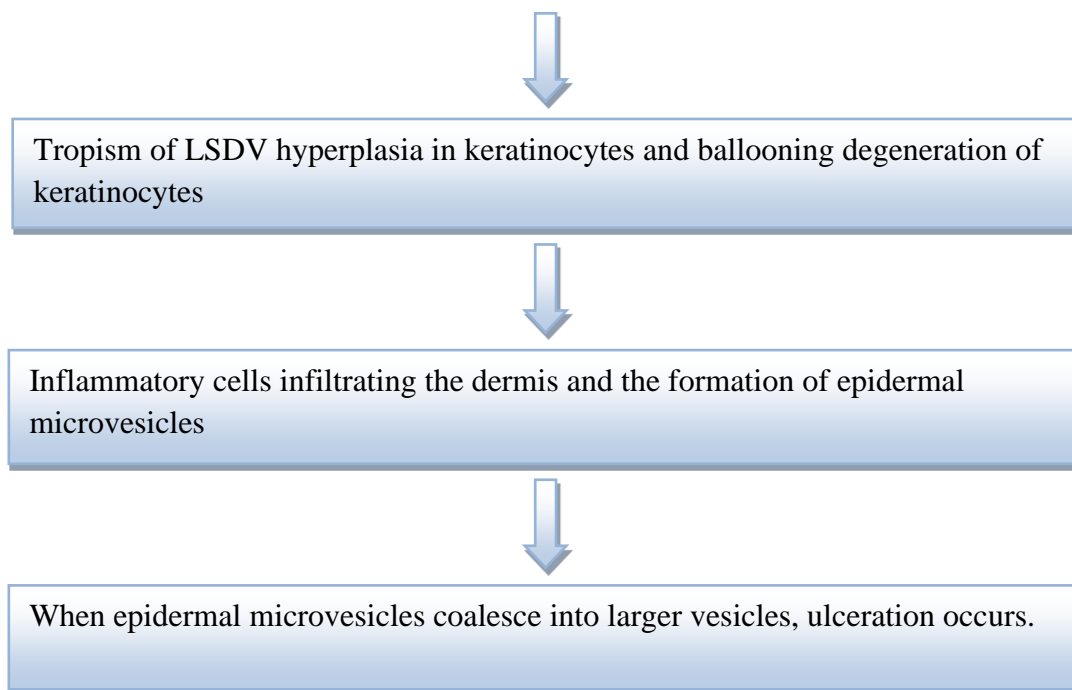
### Clinical History:

Clinical characteristics were anorexia, persistently high fever (40.5–41.5°C), severe sadness, and a recognizable bulk (lumps).the entire skin. The nodules, which measured 3–8 cm in diameter, were found in the neck, nares, nose, back, legs, perineum, scrotum, eyelids, ear, nasal, and oral mucosa, as well as the tail . The afflicted animals also showed signs of emaciation, lacrimation, nasal discharge, necrotic plaques in the mucous membranes of the mouth and nose, and excessive salivation.(16)

### PATHOLOGY:-

LSD has gross lesions that are well-described. Skin nodules are typically elevated, hard, and spherical in shape, however some might fuse together to form enormous, uneven plaques with defined boundaries.(17) When the nodule is incised, the sub-cutis layer is edematous and the surface is reddish-gray.(18) Widespread postmortem lesions are developing from deep skin nodules that pierce into nearby muscles and subcutaneous tissues, causing vacuities, necrosis, oedema, congestion, and bleeding.(19)The nodules finally developed a thick scab and turned necrotic as the condition worsened. In few cases under examination, there were a few nodules sporadically located on the head and neck; eventually, these nodules spread across the entire body.(20)





**Fig no .2 Pathogenesis of lumpy disease**

### **EPIDEMIOLOGY:**

Sick animals, with the exception of the first few days, were taken out in the morning. As a result, each cow's infectious period was brief.(21)

The disease has been seen to emerge in most of Sub-Saharan Africa after seasonal rains, which are always associated with an increase in the populations of various arthropod species.(22)The sharing of feed or water troughs contaminated by discharges from infected animals may act as an indirect route of LSDV transmission.(23) The virus also has the ability to recover from *Musca Glossina*, *Biomyia* and otherspecies that can spread LSD virus,virus has been detected in stomoxy calcitrans and *Anopheles stephens*.(24) This depends on the following factors: geographical location and climate; administrative conditions; Nutritional status and general status of animals. breed of cattle affected; immune status; population levels and dissemination of putative insect vectors in the various habitats; virus virulence.(25) The virus has been reported to persist in necrotic skin nodules for up to 33 days or longer, in dried crusts for up to 35 days and at least 18 days in air-dried hides..Cross protection between LSD virus and sheep or goat pox viruses has been exploited by the use of sheep pox virus for the immunization of cattle against LSD in Kenya and in the Middle East. LSD virus is remarkably stable that can be recovered from necrotic kin nodules kept at -80°C for 10 years and from infected tissue culture stored at 4°C for 6 months.(26) Smallpox viruses are very persistent and can remain alive in infected tissue for more than 120 days or possibly longer. The virus is also found in blood, nasal secretions, tear fluid and saliva, whichwas considered the main source of LSD transmission.

•Primary route:biting insect Minor route:direct contact Cutaneous lesions, saliva, nasal discharge,milk,semen,musles,Resistance to desiccation,No carier state.(27)The infection hasbeen assumed to be transmitted from infected mother to calf via milk secretions and skin abrasions.(28)

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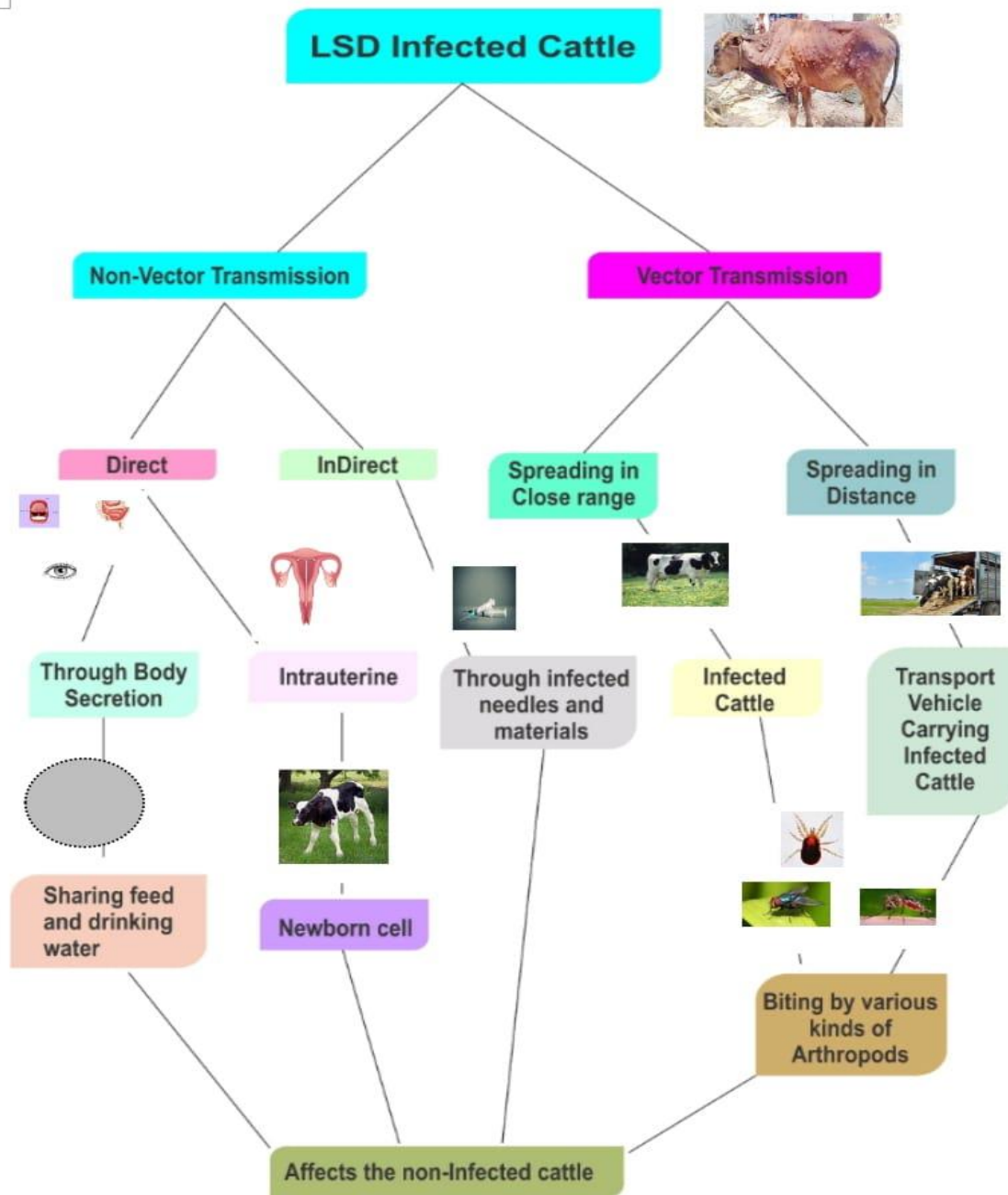


Fig.no.3 Transmission of LSDV

**RISK FACTOR:**

**1. Pathogen Risk Factors:**

One type of capripoxvirus that affects cattle of many breeds is called LSDV, and it is resistant to a variety of chemical and physical agents. Virus can survive in necrotic skin for about 33 days and remains viable for at least 18 days in air-dried skin lesions at room temperature. The virus is found in nasal, lacrimal and pharyngeal secretions, semen, milk and blood and can remain in saliva.



## 2. Host Susceptibility :

All breeds and age groups are susceptible to Bostaurus are particularly prone to clinical disease than zebu cattle..Young animals are severely affected and clinical symptoms appear rapidly

## 3. Environmental factors:

It had major impact on the agent, host and vectors as well as interaction between theme The spread of the disease in different agricultural climatic conditions, the introduction of new herds of animals and the presence of water bodies are other risk factors that would promote the spread of disease foci in different places.The vectors that play an important role in the spread of the virus remain in the environment associated with the rainy season and the arrival of autumn..(29)

## CLINICAL SIGNS:

Biphasic fever, a clinical symptom of LSD, is characterised by two episodes of fever that develop after a varying incubation period of 4–12 days (typically 7 days). The affected animals' body temperature rises to 40–41.5°C, and this can last for at least 6–72 hours and, in exceptional cases, up to 10 days.(30) Serious depression, anorexia, persistent high pyrexia (40–41.5°C), and a characteristic appearance of multiple (more than hundreds) nodules that are generally rather homogeneous in size throughout the animal's body are noticed in severe cases, which can last for seven to twelve days.(31)Particularly prominent superficial lymph nodes were prescapular and precrucial lymph nodes; in certain instances, edematous swelling of the lower gluteal muscles was also noted.(32) The animals that were affected also showed signs of emaciation, lacrimation, nasal discharge, necrotic plaques in the mucous membranes of the oral cavity and nostrils, and excessive salivation.(33)

## INCUBATION PERIOD:

After experimental infection by intradermal inoculation, a skin lesion carrying the virus most likely forms at the injection site within 1-3 weeks. The incubation period ranges from 2 to 5 weeks.(34)

Viability of host:- The dosage of the virus and the host's susceptibility to it both influence how severe the illness is. All age groups, both sexes, and different kinds and breeds of cattle are thought to be at risk for contracting LSD infection, which can have life-threatening consequences.(35)The onset of fever nearly a week after virus entry signals the beginning of the disease. Cattle having an LSD virus infection do not exhibit the traits that have been discovered.(36)

## DIAGNOSIS:

The typical clinical symptoms and test confirmation of the virus or antigen's presence are used to diagnose LSD. Such indications of LSD are indicative of numerous disorders. A definitive diagnosis is necessary to provide the most effective control and preventative actions for vulnerable herds.(37) A clinical diagnosis was made based on the features of the indicators, such as fever, cutaneous nodules, oedematous leg swelling, ventral belly, brisket region, lameness, and enlarged lymph nodes.nasal discharge, lacrimation, and so on. Based on polymerase chain reaction results, a confirming diagnosis was established.(38) The most common method of diagnosis is electron microscopy demonstration of classic capripox virions in scabs or full-thickness skin biopsies. combined with the clinical signs of an enlarged superficial lymph node and a widespread nodular skin condition.(39)In an investigation comparing several diagnostic procedures in experimentally infected cattle, it was found that PCR was a quick and accurate way to identify viral DNA in blood and skin specimens.(40) Skin biopsy samples can

also be used to try and isolate viruses. Real-time PCR, ELISA, PCR, and virus neutralization test methods are useful for identifying the antigens.(41)

#### **TREATMENT:**

To treat secondary bacterial fever and inflammation, physicians may provide antibiotics, anti-inflammatory medications, or a vitamin injection.required 6 month time period for complete recovery.(42)

Vaccination:-vaccinations containing LSDV, also known as homologous vaccinations, were utilized in all affected Balkan countries. The choice of vaccination was primarily informed by the experience and data from Israel's 2012–2013 LSD epidemics, where the use of homologous. (43) antibodies will start to show up in vaccinated animals 10–15 days after the shot and peak 30 days later.(44) Vaccines formulation : As stated in Matsiela et al., 2022, LSDV recombinant subunit vaccinations were created.Three vaccines were developed that included the LSDV antigens A27L, L1R, and a mix of both antigens.Using a centrifugation test, the stability of vaccine formulations was verified to make sure no separation occurred.(45)

#### **PREVENTION:**

To guarantee sufficient defence against LSD, susceptible adult cattle should receive a yearly vaccination.(46)Cows can be protected against LSD infection by using live attenuated vaccines that are heterologous (sheep pox or goat pox virus) or homologous (Neethling LSDV strain).(47)The spread of lumpy skin disease can be stopped by quarantining infected animals, limiting their mobility, keeping sick animals separated from the rest of the herd, and educating farmers about the need of not sharing feeding or drinking troughs.(48) To reduce the possibility of the disease spreading by vectors, cattle should get routine treatments with insect repellents. While not completely effective, this method can lower the likelihood of transmission..(49)LSD import prohibitions on animals, corpses, hides, skins, and semen can aid in keeping disease-free nations . stringent quarantines, isolation, and prohibitions on animal handling to prevent the entry of diseased animals into healthy herds Ethiopia's Lumpy Skin Disease Situation: initiatives, killing of all sick and afflicted.(50) Preventive measures include appropriate disposal of polluted area, using insect repellents, cleaning contaminated areas with disinfectant, and raising awareness.(51)

#### **ECONOMIC IMPACT:**

The Office International des Epizootics lists LSD as one of the diseases that can spread quickly and have the potential to produce a significant loss of money (OIE, 2010). 1By estimating the direct (visible) production losses—such as milk loss, mortality loss, and draft power loss—as well as the indirect effects—such as control costs—the economic impact of LSD was ascertained.(52) When farmers bring their sick animals to the public veterinary clinic in their community for treatment, the cost of medication is what is referred to as the "treatment cost." For all herd owners using a conventional mixed crop-livestock agricultural system, the LSD immunization is provided without charge.(53) The disease can cause damaged skins, slow growth in beef cattle, temporary or permanent sterility, abortion, high treatment and vaccine costs, and even death for affected animals.(54) (Alemayehu & colleagues, 2013; Babiuk, Bowden, Boyle, et al., 2008; Sajid & colleagues, 2012; Sevik & Dogan, 2017). According to Sevik and Dogan (2017), the total cost of the LSD out-breaks in 393 examined herds in Turkey was 822

940.7 GBP.(55) Due of its significant financial losses, the World Organization for Animal Health (OIE) classifies the disease as modifiable. The disease's economic significance was mostly caused by a high rate of morbidity rather than death.(56) There is currently only one initiative in Ethiopia focused on enhancing the efficacy of LSD vaccines (NAHDIC with support from NVI and MoA).(57) As LSD spread, animal losses, lower cattle industry output, and the expense of prophylactic vaccinations would result in ongoing financial loss and low productivity. It would also be predicted for certain markets to permanently disappear, leading to a decline in the rural economy and a rise in rural unemployment. (58) High expenses for immunization, disease management, diagnosis, and treatment further contribute to the financial load (Casal et al., 2018). Any major effects on China's and India's livestock industries will undoubtedly be felt throughout the global markets, given their vital roles in the meat and dairy industries. (59).

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