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Analysis of Morbidity Rate, Handling, and Mitigation of *Lumpy Skin Disease* (LSD) in Cirebon Regency

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Abstract

Background. Lumpy Skin Disease (LSD) is a strategic infectious animal disease that has a significant impact on the health of cattle and economic losses for farmers. Cirebon Regency has been one of the areas affected by the LSD outbreak since the beginning of 2023.

Aims. This study aims to analyze the morbidity rate, form of treatment, and mitigation strategies of LSD disease in Cirebon Regency.

Method. The research method used is a descriptive approach with quantitative and qualitative components (mixed methods). Quantitative data were obtained from LSD case reports in the iSIKHNAS system for the 2023–2025 period to calculate morbidity rates, while qualitative data were collected through interviews with farmers, animal health workers, and the Department of Agriculture related to LSD handling and mitigation.

Results. The results of the study show that the LSD morbidity rate in Cirebon Regency has decreased significantly from 7.86% in 2023 to 0.23% in 2024, and slightly increased to 0.75% in 2025. The decrease in morbidity is related to increased control efforts, especially vaccination, handling sick livestock, and the active involvement of animal health workers. LSD management is carried out through supportive therapy, isolation of sick livestock, cage sanitation, and vector control, while mitigation is focused on vaccination, livestock traffic restrictions, biosecurity, and livestock education. The FMEA analysis shows that livestock traffic control, vaccination coverage, and vector control are the top priorities for mitigation, with the highest risk.

Conclusion. This study concludes that LSD control in Cirebon Regency has shown positive results, but it is necessary to strengthen mitigation in an integrated and sustainable manner to prevent the re-emergence of LSD disease in the future.

Implications. The policy implications of this study emphasize the need for an integrated, data-driven, and sustainable LSD control strategy. Synergy between local governments, animal health workers, and breeders is a key factor in reducing the risk of LSD transmission and minimizing the economic impact and health of livestock in Cirebon Regency.

Keywords: Lumpy Skin Disease, morbidity, disease management, mitigation, beef cattle, Cirebon Regency.

INTRODUCTION

Cattle are not only a primary source of highly nutritious meat that benefits the community, but also a strategic commodity for maintaining national food stability. The beef cattle business is highly influential in supporting food security and the local economy, creating job opportunities and encouraging economic activity at the rural level, thereby making a real contribution to community welfare. The health of cattle is an important factor in the success of cattle development. Because health problems in cattle can cause economic losses when the productivity of cattle decreases.

Lumpy *Skin Disease* (LSD) is one of the infectious diseases that has been a concern in Indonesia in recent years. LSD disease is caused by Capripoxvirus, a member of the Poxviridae family, and can be transmitted to livestock, especially cattle, through insect vectors such as flies commonly found in livestock pens, as well as through direct contact between cattle (Sirat *et al.*, 2024). Symptoms of LSD disease are fever, nodules on the skin, decreased appetite, and decreased productivity of livestock. Economic losses due to LSD disease, such as decreased meat and milk production due to the body of livestock experiencing discomfort so that nutrients are not absorbed properly, treatment and prevention costs, and potential death or a decrease in the selling value of livestock (Dameanti *et al.*, 2023). The LSD outbreak emerged in Indonesia in 2022 and entered the area in Cirebon Regency in early 2023, causing a significant impact on the health and performance of cows. LSD disease mortality rates are relatively low, but the long-term effects on recovered livestock persist. The impact of the spread of the LSD virus in both breeding cattle and beef cattle certainly causes economic losses due to morbidity that reaches 45% and sometimes up to 100% in severe cases (Namazi, 2022). Cattle that have recovered usually still show clinical signs such as scarring of lesions on the skin, weight loss, and lymph node swelling. LSD infection is characterized by nodules on the body, fever, and decreased appetite, resulting in livestock becoming thin (Sendow *et al.*, 2021). These conditions can affect the growth performance, meat productivity, and market value of cattle.

Previous research has examined the morbidity of LSD. Based on research by Dwi Leksono (2024) entitled "Morbidity and Handling of Lumpy Skin Diseases (LSD) in Pringgondani Village and Bantur Village, Bantur District, Malang Regency", it can be known that the morbidity rate of LSD in Bantur Village and Pringgondani Village, Bantur District, Malang Regency is 1.51% and 1.56%.

Research by Siwi Meylina Rahmi, Devi Andreani Salim, Roza Azizah Primatika, Widagdo Sri Nugroho, Heru Susetya, Dyah Ayu Widiasih, Gigih Bawono (2025) entitled

"*Research Prevalence and Risk Factors of Lumpy Skin Disease in Pakem District*, Yogyakarta" can be found that the prevalence of LSD in Pakem District is 7.6%, where there is a risk factor, namely the presence of laclace which increases the risk of contracting LSD by 2.65 times greater.

Research on the handling of LSD by Faizal Rafiq (2024) entitled "Detection of the Presence of the Lumpy Skin Disease Virus in Cattle Trafficked at Merak Port and Its Control Efforts" is known that the handling of *lumpy skin disease* cases is improving livestock management, especially traditional farms, the use of good and nutritious feed, increasing public awareness and knowledge about LSD and LSD vaccination.

Firdaus Hakiki's research (2023), entitled "Case Study of Lumpy Skin Disease (LSD) in KPSP Breeder Members Setia Kawan Nongkojajar, Pasuruan," reports that the treatment of Lumpy Skin Disease (LSD) is carried out using medication, livestock medicine, herbal medicine, and vaccines.

Research by Ririn Angriani, Madi Hartono, Purnama Edy Santosa, Siswanto, and Neny Santy Jelita Lumbantoruan (2025) entitled " *Lumpy Skin Disease* (LSD) and Foot and Mouth Disease (FMD) Vaccination Activities in South Lampung Regency, Lampung Province" can be said that Lampung Province has five main strategies for handling Strategic Infectious Animal Diseases (PHMS), namely by increasing biosecurity, *testing*, treatment, vaccination, conditional slaughter, and carrying out Communication, Information, Education (KIE) to farmers.

Research by Yayan Taufiq Hidayat, Roza Azizah Primatika, and Yatri Drastini (2025) on "*Prevalence of lumpy skin disease and associated risk factors in beef cattle in Rembang Regency, Central Java*, Indonesia" can be found that the main risk factors for the spread of LSD include lack of knowledge about LSD transmission, poor waste management practices, increased vector activity during the rainy season, and distance between adjacent farms, it underscores the need for targeted and urgent interventions to control LSD.

Cirebon Regency is one of the areas directly affected by the LSD outbreak in early 2023. The first case found was a cow in Cisaat Village, Dukupuntang District, with as many as 2 heads, which spread to other villages in Cirebon Regency. In 2023, 344 cases of LSD were found by animal health workers in Cirebon Regency. In 2024, 10 cases of LSD cattle will be reported, and in 2025, there will be 26 cases of LSD cattle (Isikhnas Data on LSD Cases in Cirebon Regency). Most farmers reported cases of LSD in their cows. The handling carried out by farmers and related parties varies, ranging from symptomatic treatment, vitamin

administration, to vaccination. However, farmers' understanding of this disease still varies, so the effectiveness of treatment must be optimized.

With the research on the analysis of morbidity levels, handling and mitigation of Lumpy Skin Disease (LSD) in Cirebon Regency, it is hoped that a real picture can be obtained about the incidence rate of disease (morbidity), the form of handling, and evaluation of the efficiency of handling at the level of farmers and related agencies, as well as formulating more effective mitigation strategies. This information will serve as the basis for developing control strategies and improving disease control in the future.

Research on Lumpy Skin Disease (LSD) in cattle has been carried out extensively, both in terms of epidemiology, risk factors, handling, and control strategies. Globally, epidemiological studies of LSD show that the disease has varying morbidity rates between regions, influenced by livestock density, environmental conditions, the presence of vectors, and vaccination status (Tuppurainen et al., 2017; Ratyotha et al., 2022). Several international studies also confirm that although LSD mortality is relatively low, the economic impact due to decreased productivity and the selling value of livestock is relatively high.

In Indonesia, LSD research generally focuses on prevalence and morbidity in specific regions, such as Malang, Yogyakarta, Rembang, and Lampung districts. The studies reported varying incidence rates of LSD, as well as identifying key risk factors such as low vaccination coverage, the presence of vectors, and weak biosecurity management of livestock. In addition, several studies highlight the importance of vaccination, supportive therapy, and education of farmers as an effort to control LSD. However, most previous studies remain partial, focusing on only one aspect, such as prevalence, risk factors, or clinical treatment descriptions. Studies that integrate morbidity analysis over several years, evaluate handling by various actors (farmers, animal health workers, and the government), and conduct systematic risk mitigation assessments remain very limited, especially at the district level.

In Cirebon Regency, although LSD has been reported since the beginning of 2023 and is recorded in the iSIKHNAS system, there has not been much scientific research that comprehensively examines the dynamics of morbidity, treatment effectiveness, and mitigation priorities based on risk analysis. Therefore, research that provides a comprehensive, data-based picture of the field to inform the formulation of sustainable LSD control policies is needed.

LITERATURE REVIEW

Lumpy Skin Disease (LSD)

Lumpy Skin Disease (LSD) is an infectious animal disease caused by the LSD virus of the family poxviridae, the subfamily *Chordopoxviridae*, and the genus *Capripoxvirus*. Lumpy Skin Disease (LSD) is a disease in cattle and water buffaloes caused by the LSD virus. This virus belongs to the family Poxviridae, genus Capripoxvirus, along with two other virus species: *Goatpox* and *Sheeppox* (OIE, 2017). The disease was first reported in Africa in the early 20th century and has since spread to the Middle East, Eastern Europe, Asia, including Indonesia. The disease is endemic in some tropical and subtropical regions and has the potential to spread rapidly, especially in dense livestock populations.

LSD virus (LSDV) can spread through a variety of ways, such as indirect contact between animals through vectors, transmission through livestock management, transmission through cement, and livestock traffic. Susceptible livestock are cows (Bos indicus and Bos taurus), which are the main hosts, while buffaloes, sheep, and goats are very rarely infected. The prevalence of LSD is higher in cattle with old age, heifers, and cattle reared in rural areas. Cows with ages 1–3 years (54.93%) had a higher incidence rate than other age groups (<1 year = 26.76% and >3 years = 18.31%); in female cows (73.24%) compared to bulls (26.76%); and in sub-rural (42.25%) and rural (39.44%) areas compared to urban (18.31%) (Gharban *et al.*, 2019).

The LSD outbreak caused significant economic losses to small groups of farmers, and home farmers were the most affected. This disease has a serious impact on cow production, dairy products, and animal body conditions, as well as causing skin damage, abortion, and infertility (Tuppurainen *et al.*, 2017). Cows that have been infected with LSD are less in demand by buyers because of the presence of nodules on the cow's body, so breeders must lower the price so that the cow sells well or does not even sell. Looking at the losses caused and data from the spread of LSD disease in Indonesia, it is important to increase knowledge related to LSD among the public, especially farmers and health workers, in dealing with LSD cases (Dameanti *et al.*, 2023).

Clinical Symptoms of LSD Disease

The most visible clinical symptom is the presence of nodules on the skin, which are obvious and protrude beneath the skin, measuring 2-5 cm in diameter. These nodules are usually found on the head, neck, back, abdomen, and tail. Symptoms of LSD are characterized by fever in cattle reaching 41.5 °C, the appearance of nodules on the body of cows with a

diameter of about 2-5 cm, decreased appetite, decreased milk production, and rapid spread to other cows in the same pen (Sendow *et al.*, 2021). Lumpy *Skin Disease* (LSD) has an incubation period of about 4 – 7 days in experimentally infected animals and can reach five weeks in natural infections (Tuppurainen *et al.*, 2017). In severe cases, corneal lesions can cause blindness, secondary infections of the legs that cause lameness, pneumonia, and mastitis. Post-mortem examination showed the presence of pox lesions on the gastrointestinal tract, respiratory tract, and on the surfaces of various internal organs (OIE, 2016).

The clinical symptoms caused by LSD can be divided into four phases, namely the first phase is an acute phase characterized by a high fever up to a temperature of 41℃ for seven days accompanied by excessive saliva secretion, decreased increase in nasal mucus, and nodule lesions on the skin, then the second phase is characterized by swelling of the subscapular and precursor lymphodus which is characterized by the presence of nodule lesions with a diameter of 0.5-5 cm in the genital area, neck, stomach, head, nose, and mouth. The nodules will rupture after 1-2 days, spreading the virus into the environment. The third phase is characterized by ulceration of the injured skin and necrosis that secretes mucous fluid. This phase occurs 2-3 weeks after viral inoculation. The fourth phase is the regeneration phase, during which the skin will experience regeneration and hyperpigmentation (Ratyotha *et al.*, 2022).

Symptoms of LSD disease in cows can also affect reproductive function, such as decreased libido, abortion in pregnant cows, sexual failure, and a drastic decrease in milk production. This is because livestock experience a decrease in appetite, disrupting metabolic processes in their bodies when required nutrient intake is insufficient (Fahrudin, 2024). LSD can also cause various other disorders, such as respiratory and digestive disorders, namely nasal discharge, mild cough, hypersaliva, and even diarrhea, where the subsequent impact is lean cattle, chronic skin lesions, and significant economic losses (Huda, 2024). Clinical symptoms vary greatly among individual cows, but the most common are high fever, hypersalivation, and the appearance of nodules on the typical cow's skin. Therefore, early identification of the symptoms of cattle exposed to LSD is essential to prevent wider spread.

Spread of LSD Disease

Transmission of LSD in general can occur directly through blood-sucking vectors, such as mosquitoes, ticks, and flies. The most likely vectors of LSD virus transmission are blood-sucking arthropods such as stable flies (*Stomoxys calcitrans*), mosquitoes (*Aedes aegypti*), and ticks (*Rhipicephalus* and *Amblyomma* species), all of which can transmit the LSD virus within just 1 hour of sucking the blood of infected cows, and the suspected vectors are known to

spread only mechanically (Sendow *et al.,* 2021). Infection can also be transmitted to susceptible animals through direct contact with infected animal secretions, such as body discharge or skin lesions, and contamination from animal owners and cage equipment (Ratyotha *et al.*, 2022).

Cases of *Lumpy Skin Disease* (LSD) often come from the legal and illegal transfer of cattle between farms, between regions, and even between countries. This movement of cattle allows the virus to spread over long distances, such as through livestock traffic and feed materials, and through short-distance transmission by blood-sucking insects that move between livestock (usually less than 50 km) (Tuppurainen *et al.,* 2017). LSD disease is not contagious in humans. LSD transmission can also be indirect, for example, through cage equipment, the entry and exit of farmers, feeding and drinking areas, and unsanitary cage environments. Transmission of LSD disease can be through indirect contact through contamination from animal owners and cage equipment (Ratyotha *et al.,* 2022). LSD does not include zoonotic diseases. LSD is an infectious disease in animals, but it is not zoonotic in humans (Dameanti *et al.,* 2023).

Factors that can affect LSD transmission include environmental factors, livestock management, and epidemiological factors. Environmental factors, such as high temperatures and humidity, can favor vector populations. High rainfall can increase insect and mosquito populations. Livestock management factors such as livestock density, cage cleanliness, and breeders' knowledge are both related to livestock health and related to the arrangement of sick and healthy livestock cages. Epidemiological factors such as large cattle populations, low vaccination coverage, and delays in early detection. Risk factors for the spread of LSD include new animals originating from infected areas, low livestock vaccination status, clinical signs appearing on nearby farms, and poorly maintained vector control (Huyen *et al.,* 2023).

LSD Disease Management and Control

Clinical treatment aims to minimize secondary symptoms and infections in LSD disease. Some of the measures taken include isolating infected livestock, providing symptomatic treatment, and treating wounds and lesions. Infected livestock are isolated for 3–4 weeks to prevent healthy livestock from becoming infected. Antipyretic treatment, analgesics to lower fever, antibiotics to prevent secondary infections due to nodule wounds, and the administration of vitamins to increase the stamina of livestock. Wound care is performed using antiseptics to promote healing and prevent secondary bacterial infections. LSD treatment is

symptomatic and aimed at preventing complications of secondary bacterial infections by using a combination of antimicrobial and anti-inflammatory drugs (Tuppurainen *et al.*, 2017).

Efforts to control *Lumpy Skin Disease* (LSD) are carried out through vaccination of cattle in high-risk areas before the outbreak, strict control of livestock traffic, and regular administration of anti-insect drugs (repellent) to reduce the risk of vector transmission, although these measures cannot completely prevent the spread of the disease (Tuppurainen *et al.*, 2017). Prevention of LSD disease in addition to regular vaccination, namely by carrying out good hygiene and sanitation in the condition of livestock and the environment (Andri, 2023). Sanitation hygiene involves maintaining the cleanliness of buildings where livestock or cages are kept and the surrounding environment to protect the health of livestock and breeders, with the aim of reducing the risk of disease, including cage hygiene procedures (Auranzha *et al.*, 2024).

Epidemiology

Epidemiology is a science that studies the distribution (spread of health problems), frequency (the magnitude of health problems), and determinants (causative factors/factors that affect it) of health problems that afflict a group of people or communities and their application to control health problems (Sari *et al.*, 2021). There are many definitions of epidemiology, but they share a common thread: the study of populations. The goal of epidemiology is to understand disease patterns, predict risks, and design effective control strategies. The purpose of epidemiology is to diagnose population health problems, determine the natural history and etiology of diseases, and assess and plan health services (Lapau & Birwin, 2017).

The first case of LSD disease was reported in 1929 in Zambia, and by the 1940s, it became endemic to all African states. In 1988, the LSD outbreak spread in Egypt. After the 2000s, LSD spread in the Middle East, and then, around 2013, it entered the territory of Turkey and Iraq. From 2013 to 2017, it was reported that LSD cases began to spread in other regions such as Southeast Europe, including Turkey, Greece, Bulgaria, Serbia, Kosovo, Albania, and Montenegro (Calistri *et al.*, 2018). In 2020, LSD was reported in Thailand, Cambodia, and Malaysia (FAO, 2020). Until it reaches Indonesia at the end of 2022.

The first positive case of LSD in Indonesia occurred in Indragiri Hulu Regency, Riau Province in terms of clinical diagnosis of LSD carried out in the field by animal health workers, from January 1 to July 31, 2022 as many as 322 cases from 169 farms, with a proportion of 0.79% and confirmed through PCR tests by the Bukittinggi Veterinary Center (Letter No: 15001/PK.310/F4B.1/02/2022) and the Bogor Veterinary Center (Letter No: B-

201/PK.310/H.5.1/2/2022) in February 2022. Riau Province was designated as an LSD outbreak area based on the Decree of the Minister of Agriculture of the Republic of Indonesia No. 242/KPTS/PK.320/M/3/2022 in March 2022 (Minister of Agriculture of the Republic of Indonesia, 2022). LSD disease has been reported in West Java since the end of 2022 and has since spread to regencies/cities across the region (Supriyanto, 2023).

Morbidity and Mortality

Morbidity is a term in epidemiology that describes the level of illness or the number of individuals in a population who suffer from a specific disease or health condition over a given period (Nurbaiti & Rasyid, 2025). Measuring morbidity is important for understanding how much an illness affects a population. The morbidity of LSD disease is around 10 - 20%, and the highest is at 45%, with a mortality rate of 1 - 5%, but it is very rare (WOAH, 2022). The prevalence rates of LSD in several other regions are: Egypt 24%, Russia 29%, China 19.5%, India 13.93%, Bangladesh 78%, Thailand 4.17%, Mongolia 5.9%, and Ethiopia 36.2% (Ratyotha *et al.*, 2022). The morbidity rate of a disease can be reduced by controlling the disease appropriately, so that its spread or transmission is not widespread and outbreaks or disease cases are minimized (Zalizar *et al*., 2022).

Age factors and the immune status of cattle affect the morbidity of LSD. Young cattle and cattle that have not been vaccinated tend to be more susceptible to infection and show more severe clinical symptoms than adult cattle or cattle that have been vaccinated. Cages that maintain good sanitation and biosecurity have a lower risk of infection than those that do not. Geographical conditions, maintenance management, nutritional status, immune status, livestock type, population, and the distribution of insect vectors affect LSD mortality and morbidity rates (Akhter et al., 2023; Hidayatik et al., 2025). Understanding LSD morbidity is carried out as a basis for disease control and mitigation planning. The high morbidity rate indicates an immediate need for interventions, such as vaccination, quarantine, biosecurity, livestock isolation, and vector control, as crucial steps to reduce the risk of transmission (AIHSP, 2025). Thus, routine morbidity monitoring is one of the important aspects in the management of LSD disease in endemic and epidemic areas.

Mortality is the percentage of livestock deaths from a disease in a population. In general, LSD mortality rates are relatively low, ranging from 1-5%. The LSD mortality rate is only about 1-5%, which is relatively low and very rare (WOAH, 2022). Although mortality is low, LSD can still cause death due to high fever for a long time, dehydration, secondary infections such as pneumonia, and severe skin infections, as well as acute decreased appetite,

which can reduce the health condition of livestock, leading to death. Secondary infections of LSD can occur, especially pneumonia, and nodules bitten by flies will cause deep wounds (Sendow *et al.*, 2021). Livestock mortality due to LSD occurs as a result of the low knowledge of breeders to detect early, so that late treatment is carried out.

Losses of LSD

Lumpy Skin Disease (LSD) is one of the infectious diseases in cattle that has the potential for a very wide spread; it can cause economic losses for farmers and can threaten food security, especially the national meat and milk supply (Abdurrahman *et al.*, 2024). The outbreak *of Lumpy Skin Disease* (LSD) causes various adverse impacts for farmers, including damage to the cow's skin which causes a decrease in selling value, weight loss, reduced milk production, can cause reproductive disorders such as abortion and temporary infertility in infected livestock, and farmers must bear additional costs for the implementation of vaccinations, symptomatic treatment, control of infectious vectors, and disinfection activities cage environment to prevent further spread of disease (Dameanti *et al.*, 2023). The largest loss caused by LSD infection occurred in cases of high severity that caused the death of livestock. In Turkey, the total loss due to the LSD outbreak was estimated to reach 822,940.7 GBP, or equivalent to approximately Rp16.25 billion in rupiah exchange rates (Sevik, 2017).

LSD Mitigation

Mitigation of Lumpy Skin Disease (LSD) is carried out through integrated approaches, including vaccination, movement/mobility control, quarantine, biosecurity, vector control, strengthening active and passive surveillance, increasing awareness of risk mitigation, and extensive surveillance within vaccination zones (Roche *et al.*, 2020). Comprehensive vaccination is an important step toward establishing herd immunity and reducing the rate of spread, which is further strengthened by controlling vectors such as flies, mosquitoes, and ticks through cage sanitation and insecticide use. Vaccination programs carried out simultaneously can reduce the spread of LSD disease (Gunawan *et al.*, 2024). Restrictions on the movement of cattle to and from affected areas are necessary to prevent inter-regional spread, while biosecurity measures include isolating sick animals, disinfecting equipment, and restricting people's access to the enclosure.

Biosecurity is important to implement, as it directly relates to the health and sustainability of livestock businesses by preventing the spread of diseases, maintaining livestock health, and reducing the risk of zoonotic diseases (Panjono *et al.*, 2024). Active

surveillance, rapid reporting, and laboratory diagnostics help detect cases early, enabling timely mitigation responses. All of these strategies complement each other and have proven effective in reducing the rate of transmission and economic impact of LSD in endemic areas. In LSD risk management guidelines, strict quarantine of infected animals and separation from healthy animals are part of the mitigation strategies that must be carried out (AIHSP, 2025).

FMEA (*Failure Mode and Effect Analysis*)

FMEA is a proactive risk management method for the identification of all potential failures that may occur in designs, production processes, or products with the purpose of use to determine the highest action or reduce risk, risk priority is determined from the risk value in the form of a Risk Priority Number (RPN) with several factors, namely the severity of the failure if it occurs (*severity*), the frequency of failure that occurs (*occurrence*) and the possibility of failure to be detected before the incident (*detection*) (Hisprastin & Musfiroh, 2021). FMEA is a tool for continuous quality improvement that uses structured analysis to identify modes/potential failures, and their effects (Priambodo *et al*., 2021).

The FMEA assessment of *severity, occurrence,* and *detection* is set in stages from 1 to 10, where 10 indicates the most severe impact, while 1 indicates the least (Apriyan *et al.*, 2017). One of the main outputs of the FMEA analysis is the Risk Priority Number (RPN), which is calculated based on *severity (S), occurrence (O)* and *detection* (D), which provides an overview of the priority of failure risk that needs to be addressed first so that appropriate corrective steps can be taken (Prakoso & Marwan, 2025).

Based on the literature review and empirical conditions in the field, several research gaps underlie this research. First, there is still limited research that examines changes in LSD morbidity rates longitudinally over a period of several years at the district level, so the effectiveness of control programs has not been evaluated empirically. Second, most previous studies have not linked morbidity data to an integrated evaluation of handling and mitigation, especially those that examine the roles of farmers, animal health workers, and local governments simultaneously. As a result, the recommendations often do not address the overall policy implementation aspect. Third, there are limitations of studies that use quantitative risk management approaches, such as FMEA, to identify and prioritize failure factors in LSD control. In fact, this approach is important for helping policymakers determine the focus of the most impactful interventions. Fourth, specifically in Cirebon Regency, there is no comprehensive study documenting the relationship between morbidity trends, treatment patterns, and LSD mitigation strategies based on field data and official reporting systems.

Therefore, this study seeks to fill this gap by presenting scientific evidence to inform the formulation of more effective and sustainable LSD control policies and strategies.

METHODS

This study uses quantitative and qualitative descriptive research methods (*mixed methods*). The quantitative descriptive approach aims to calculate the morbidity rate of *Lumpy Skin Disease* (LSD), while the qualitative descriptive approach is used to describe the treatment and mitigation of LSD disease. This study is descriptive because it aims to provide a real picture of the condition of LSD occurrence in Cirebon Regency.

DISCUSSION

Epidemiology of LSD Disease in Cirebon Regency

Diseases: Lumpy Skin Disease (LSD) is a viral disease that affects cattle and is caused by the Lumpy Skin Disease Virus of the family Poxviridae. It is spread primarily through vectors such as mosquitoes, flies, and ticks, and through direct contact between livestock and farmers. LSD first appeared in Africa and in recent years has spread to Asia, including Indonesia. In Cirebon Regency, cases were recorded for the first time since the beginning of 2023 in the iSIKHNAS system, and the number of cases continued to increase over the next few months. During the 2023 period, LSD cattle were recorded as accounting for 344 of the total cattle population in Cirebon, spread across 29 sub-districts and 66 villages. Factors influencing the epidemiology of LSD in this area include the intensity of livestock contact, the presence of vectors, weather conditions (especially the rainy season, which multiplies vector populations), and diverse livestock management practices. According to AIHSP (2025), LSD disease tends to be sporadic, depending on animal movements, immune status, and wind and rainfall patterns that affect vector populations.

Morbidity of LSD Cattle in Cirebon Regency

Based on the results of the study, the morbidity rate of Lumpy Skin Disease (LSD) in Cirebon Regency during the 2023–2025 period shows significant changes. In 2023, the LSD morbidity rate was recorded at 7.86%, which indicates that LSD disease still attacked cattle in Cirebon Regency in that period. The high morbidity in 2023 is suspected to be related to the still active transmission of the disease, limited early detection, the absence of an LSD vaccine, and the implementation of LSD control in the field that is not optimal. This is in accordance

with the statement of Tuppurainen *et al. (2021) that the morbidity rate in cattle varies between 2–45%*. LSD morbidity rates vary from region to region due to several factors.

In 2024, the morbidity rate of LSD will decrease very sharply, to 0.23%. This decrease shows improvements in disease control efforts, such as vaccination, handling sick livestock, and the active role of animal health workers in controlling LSD. However, there are still cases of LSD, which indicates that the transmission of the disease has not been completely eliminated. In 2025, the LSD morbidity rate was recorded at 0.75%, which indicates a slight increase compared to 2024, but still much lower than in 2023. This condition indicates that LSD still has the potential to reappear if control efforts are not carried out consistently. According to Sendow *et al. (2021), the most potential transmission of LSD is through mechanical vectors, which can spread the LSD virus from one area to another* through the transportation of infected livestock.

Overall, the trend of LSD morbidity in Cirebon Regency during 2023–2025 shows a significantly decreasing pattern with mild fluctuations. This indicates that the LSD control program has had a positive impact, but it is still necessary to strengthen the control strategy in a sustainable manner. According to the statement of the Directorate General of PKH (2022), the Lumpy *Skin Disease* (LSD) control strategy is carried out through limited *culling (focal culling*) and appropriate disposal of contaminated products and materials to eliminate sources of infection, livestock traffic control and the implementation of quarantine, cleaning and disinfection of livestock facilities and equipment, determining the zoning of infected areas, and the implementation of emergency vaccinations to reduce vulnerable livestock populations, sustainable vector control, strengthening surveillance, and implementing communication, information, and education (KIE) to increase the involvement of farmers and stakeholders in LSD control efforts.

LSD Handling in Cirebon Regency

The handling carried out at the time of the LSD outbreak in Cirebon Regency was based on the results of interviews, namely from the perspective of farmers, including contacting animal health officers for examinations, and providing traditional medicine with spices. The cage was thoroughly cleaned and treated with disinfectants, Dalmat, and detergent to control vectors. According to Liang *et al. (2022), this LSD virus is susceptible to several disinfectants*, especially organic materials and detergents. If the cattle infected with LSD improve, the breeder continues to provide supplements or vitamins, while for cows whose condition does not improve, the breeder must carry out forced slaughter. However, to date, some farmers do

not provide special isolation cages for sick livestock, while others have provided them. This will be one of the ways to spread the disease quickly in one area. According to Sirat *et al. (2024), poor cage management is a risk factor* for the occurrence of LSD disease.

The handling carried out by Animal Health Officers includes body temperature checks and physical examinations of LSD-infected cows, based on reports from breeders and submitted to the iSIKHNAS system in real time, as well as a copy of the report sent to the Agriculture Office. Health officers also suggested isolating infected livestock, but there are still many farmers who violate. Health workers provide supportive therapy with vitamins and treatment according to symptoms, such as antipyretics, antibiotics, and/or antihistamines. According to Sirat *et al. (2024), treatment that can be done in animals infected with LSD is only in the form of supportive therapy*, which is expected to prevent animals from secondary infections and can improve the animal's condition.

Vector cleaning efforts are carried out by providing dalmat and disinfectant to sanitize and maintain biosecurity in the cage. If the cow is in conditions that prevent recovery, focal culling can be carried out with the owner's permission. However, for LSD cases, most cases were declared cured because LSD disease was classified as having a low mortality rate. After the cow recovered from LSD disease, health officers suggested administering LSD vaccines as an effort to prevent LSD disease in the future. According to Liang *et al.* (2022), the LSD vaccine is able to form protective antibodies in cows and provide long-term immunity to the LSD virus.

LSD handling by the Agriculture Office, which oversees livestock and animal health, includes receiving reports on LSD cattle cases from field officers and providing technical guidance on handling infected cattle, as well as treatment facilities and infrastructure in the field, such as supportive medicines, disinfectants, and LSD vaccines. The agency monitors the inspection of letters entering and leaving livestock, and coordinates across sectors to supervise LSD cattle cases. Furthermore, the agency prepared a follow-up after the LSD outbreak by providing treatment and vaccination, as well as limiting and supervising livestock traffic. This is in accordance with the question of Sirat et al. (2024) that LSD control can be carried out with the help of relevant agencies for socialization and education about LSD, reporting LSD cases, reducing livestock mobility, implementing biosecurity in controlling vectors, and subsequently vaccination.

LSD vaccination also showed a high risk, with an RPN of 351.4. This failure is influenced by the limited availability of vaccines and the low participation of farmers. As a result, vaccination coverage has not reached the level necessary to form herd immunity, so the

risk of disease transmission remains high. According to Gordon (2024), vaccination has been identified as an effective prevention and control measure against LSD because it can reduce the risk of transmission in livestock populations when used widely and consistently alongside other control measures, such as animal traffic restrictions.

Vector control ranks third with an RPN of 304.8. It indicates that efforts to control virus-carrying insects have not been consistent. Poor environmental sanitation and unscheduled vector control accelerate LSD transmission, especially in livestock environments with high livestock density. According to Liang *et al.* (2022), LSD transmission occurs mostly mechanically through blood-sucking insects (vectors), so vector control is an important strategy for preventing and controlling the spread of this disease in high-population livestock environments.

Overall, the FMEA results indicate that the priority for LSD mitigation in Cirebon Regency should focus on controlling livestock traffic, increasing vaccination coverage, and strengthening vector control. This condition indicates that restrictions on livestock movements, increased vaccination coverage, and scheduled and sustainable vector control have not been implemented optimally. Weak compliance with regional zoning and low participation of farmers increase the potential for the spread of LSD to other regions, considering that this disease is classified as a cross-border animal disease. This is in accordance with the statement of Liang et al. (2022) that LSD disease is categorized as a transboundary animal disease because of its ability to spread rapidly between regions through the movement and trade of live livestock. Therefore, livestock traffic control is an important factor in LSD prevention and control strategies. In addition, inconsistent vector control, especially in livestock environments with high livestock density, also accelerates disease transmission. Therefore, it is necessary to strengthen policies and implement integrated mitigation measures, including controlling livestock mobility, equitable mass vaccination, and effective environmental and vector management, to reduce the risk of LSD spread in Cirebon Regency.

The novelty of this research lies in several main aspects. First, this study presents a temporal analysis of LSD morbidity trends over three years (2023–2025) in Cirebon Regency, providing an overview of disease dynamics before and after control interventions, especially vaccination and the increased role of animal health workers. Second, this study integrates a mixed-methods approach, namely quantitative morbidity data from iSIKHNAS with qualitative data from interviews with farmers, animal health workers, and the Agriculture Office. This approach allows for a more comprehensive understanding of field conditions, not only in terms of disease incidence rates, but also handling practices and constraints on

mitigation implementation. Third, this study adopts Failure Mode and Effects Analysis (FMEA) as a risk analysis tool in LSD disease mitigation. The use of FMEA in the context of infectious animal diseases, particularly LSD at the district level, is still very limited. This approach offers a novel way to determine mitigation priorities based on Risk Priority Number (RPN), enabling control strategies to be directed more effectively and measured. Thus, this study is not only descriptive, but also offers a new analytical framework in LSD control that combines epidemiology, field practice, and risk management

CONCLUSION

Lumpy Skin Disease (LSD) is an infectious disease in cattle that has a significant impact on livestock health and the economy of farmers in Cirebon Regency. The results of the study show that the LSD morbidity rate in Cirebon Regency experienced a marked downward trend during the 2023–2025 period, from 7.86% in 2023 to 0.23% in 2024 and 0.75% in 2025. This decline reflects improvements in disease control efforts, although LSD still has the potential to re-emerge if control is not carried out consistently.

The handling of LSD in Cirebon Regency is carried out through collaboration between farmers, animal health workers, and the Agriculture Office, including symptomatic treatment, isolation of sick livestock, cage sanitation, vector control, and post-recovery vaccination. However, obstacles remain, including low compliance among farmers with livestock isolation and limited facilities for sick livestock. The results of the FMEA analysis show that livestock traffic control, LSD vaccination, and vector control are the highest-risk factors that require major attention in mitigation strategies.

Overall, LSD control and mitigation in Cirebon Regency have had a positive impact on reducing disease morbidity, but they need to be strengthened through higher vaccination coverage, stricter livestock traffic surveillance, consistent biosecurity implementation, and greater farmer education and awareness. An integrated and sustainable mitigation approach is urgently needed to reduce the risk of LSD transmission and minimize future economic losses.

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