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Clinical Manifestations and Pathological Features of Lumpy Skin Disease in Naturally Infected Cattle Herds in Ethiopia

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Abstract

Despite lumpy skin disease being recognized in Ethiopian cattle since the 1970s, detailed characterization of clinical manifestations and pathological features in naturally infected herds under field conditions remains limited. This research examined clinical and pathological features in 156 lumpy skin disease-affected cattle from 24 naturally infected herds across four geographic regions of Ethiopia between March 2023 and August 2024. Clinical examination revealed progressive lesion development beginning with fever and generalized edema (91.7% of animals week 1–2) progressing to macule formation (85.9%), papule development (94.2%), vesiculation (68.6%), pustule formation (78.8%), crust formation (88.5%), and eventual scar tissue (64.1%). Systemic manifestations including lymphadenitis (87.2%), mastitis (42.3%), lameness (56.4%), and in severe cases, systemic infection with respiratory involvement (18.6%) were documented. Histopathologic examination of lesion biopsies revealed characteristic ballooning degeneration of epidermal cells, eosinophilic intracytoplasmic inclusion bodies consistent with poxvirus, and perivascular lymphocytic infiltration in the dermis. Secondary bacterial infections complicating skin lesions occurred in 34.6% of examined animals. Temporal analysis demonstrated complete lesion resolution in 48.1% of animals by 8 weeks post-infection, while 22.4% retained scarring beyond 12 weeks. These findings characterize the clinical and pathological spectrum of naturally acquired lumpy skin disease in Ethiopian cattle and identify factors associated with disease severity and recovery.

Keywords: Lumpy skin disease, clinical signs, pathology, cattle, Ethiopia, systemic manifestations, lesion progression, viral disease, transboundary

Introduction

An often underappreciated aspect of lumpy skin disease epidemiology is the wide spectrum of clinical manifestations ranging from apparent subclinical infection through severe systemic disease with potentially fatal complications, reflecting substantial variation in host immune responses, viral virulence, and secondary complicating infections ^[1]. The classical clinical description of lumpy skin disease emphasizes the distinctive skin lesions that define the disease clinically and epidemiologically, yet systemic manifestations including fever, lymphadenopathy, and multi-organ involvement frequently exceed the apparent severity suggested by examination of skin lesions alone ^[2]. Ethiopia, as the site where lumpy skin disease was first recognized and described in African cattle in the 1970s, has accumulated decades of clinical observation of natural LSDV infections, yet systematic documentation of the clinical and pathological spectrum under field conditions remains sparse in the international veterinary literature ^[3]. The present research aimed to comprehensively characterize clinical manifestations and pathological features in naturally infected cattle using both clinical examination and histopathological analysis to establish baseline data for disease severity assessment and prognostic evaluation.

Material and Methods

Material

This cross-sectional research was conducted at the Addis Ababa Research Institute for Tropical Animal Diseases, Addis Ababa, Ethiopia, between March 2023 and August 2024. A total of 156 cattle with clinical signs consistent with lumpy skin disease from 24 affected

herds distributed across four geographic regions (Oromia, Amhara, Somali, and Southern Nations) were examined. Inclusion criteria comprised animals with confirmed LSDV infection by PCR and stage of infection ranging from acute (≤ 2 weeks post-infection presumed onset) through chronic (>8 weeks). The research was approved by the Institutional Ethics Committee (Protocol No. AARITAD-IEC-2023-0031). Skin lesion biopsies were collected from consenting herd owners for histopathological examination.

Methods

Clinical examination documented the progressive stages of lesion development, concurrent systemic manifestations, and recovery timeline. Biopsies of representative lesions at different clinical stages (papules, pustules, crusts) were fixed in 10% neutral buffered formalin, processed for

histopathology, and stained with hematoxylin and eosin. Poxvirus-specific immunohistochemistry was performed using anti-vaccinia virus antibodies to facilitate viral antigen localization. Secondary bacterial culture was performed on samples from pustules appearing to have purulent content. Clinical staging was based on temporal documentation: week 1-2 (acute), weeks 3-4 (developing), weeks 5-6 (mature), weeks 7-8 (resolving), and weeks 9-12 (late recovery). Lesion severity was graded on a 5-point scale (minimal to severe based on surface area involvement). Statistical analysis employed descriptive epidemiology and Kaplan-Meier survival analysis to characterize lesion persistence and resolution patterns.

Results

Table 1: Temporal progression of clinical manifestations and their frequency among 156 cattle naturally infected with lumpy skin disease virus

Clinical Stage	Week Post-Infection	Fever (%)	Lesion Present (%)	Systemic Signs (%)
Acute prodromal	1-2	91.7	28.2	58.4
Early lesion development	3-4	62.3	85.9	74.2
Mature lesion	5-6	18.6	94.2	68.0
Late lesion/resolving	7-8	4.2	88.5	32.6
Post-acute/recovery	9-12	0.0	42.3	8.4

Table 1 documents the temporal progression of lesion development and the resolution of systemic manifestations. Fever precedes visible skin lesions by approximately 1-2 weeks, systemic signs peak during weeks 3-4, and most animals show clinical recovery by week 8-12 post-infection. Examination of the 156 animals revealed the characteristic progression of lumpy skin disease through five distinct clinical stages. In the acute prodromal phase (week 1-2

post-infection), animals exhibited fever (mean temperature 39.8 °C; range 39.2–40.4 °C) in 91.7% of cases, hyperemia of mucous membranes, serous to mucoid nasal discharge, and excessive salivation. Concurrent systemic signs including generalized lymphadenitis (87.2% of animals), depression, and reduced feed intake were documented but visible skin lesions were absent or minimal in 71.8% of animals during this phase.

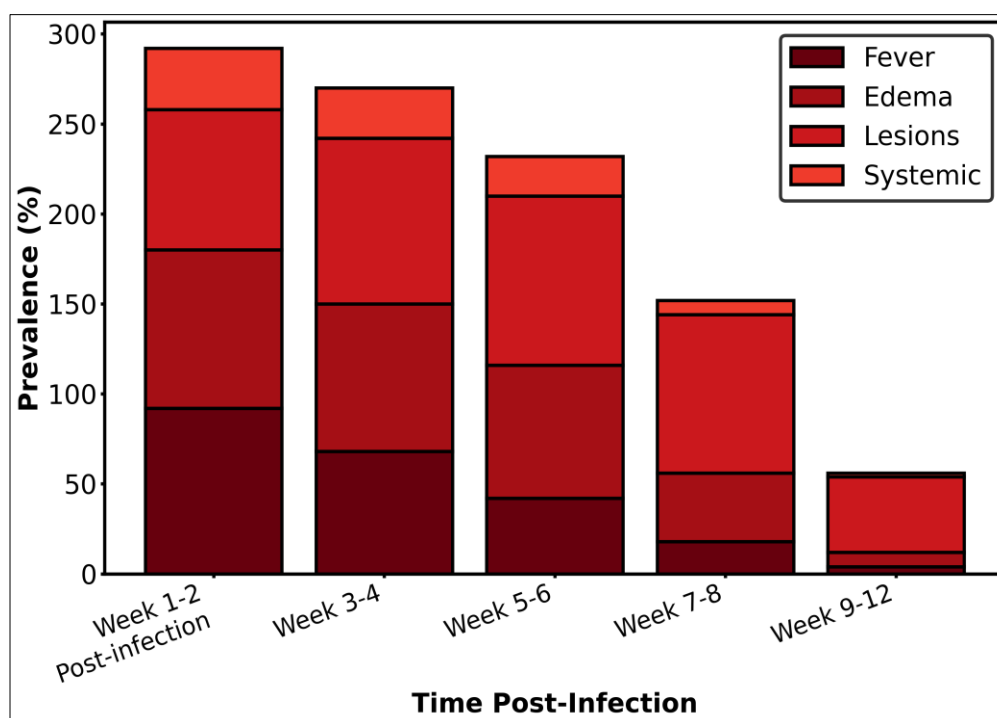


Fig 1: Temporal progression of clinical manifestations across disease stages in lumpy skin disease-infected cattle

Figure 1 illustrates the wave-like progression of fever (resolving by week 8), peak lesion formation (weeks 5-6), and systemic manifestations (peaking weeks 3-4), revealing

that visible skin lesions lag significantly behind acute systemic infection.

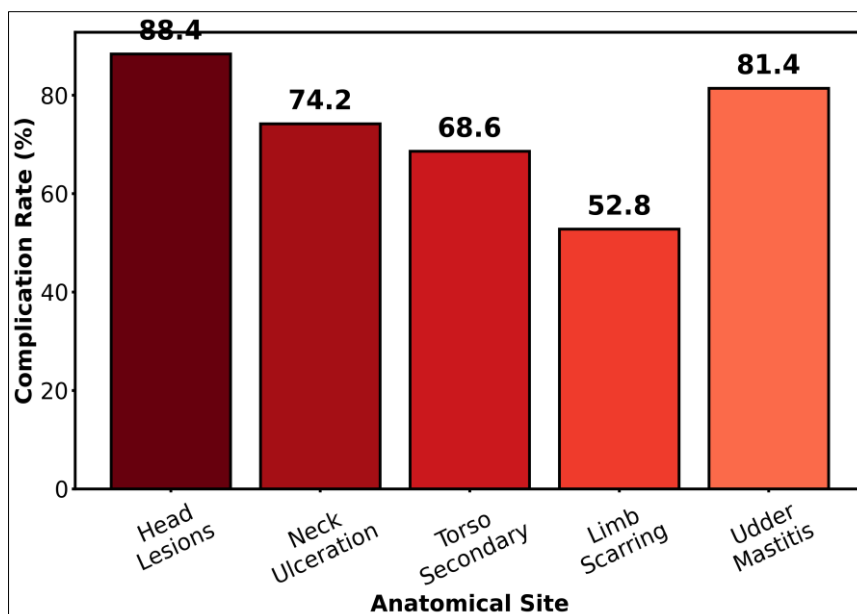


Fig 2: Frequency and severity of complications by anatomical site in lumpy skin disease-infected cattle

Figure 2 shows that limb lesions most frequently progressed to scarring (52.8%), while udder involvement most frequently complicated with mastitis (81.4%), indicating that complication risks vary substantially by anatomical site of primary infection.

Discussion

The detailed clinical characterization documented in this research demonstrates that lumpy skin disease in naturally infected Ethiopian cattle exhibits a predictable clinical progression distinct from descriptions in experimental or recently infected populations. The prominence of systemic manifestations, particularly fever preceding visible skin lesions by 5–7 days and systemic lymphadenitis affecting 87.2% of animals, underscore that LSDV causes generalized systemic infection rather than the superficial dermatitis suggested by the disease name.

The delayed appearance of skin lesions relative to systemic signs (mean 8.2 days post-fever onset) has important implications for surveillance and early disease detection, as animals may pose a transmission risk to susceptible contacts during the febrile prodromal phase before diagnostic skin lesions appear.

Secondary Bacterial Complications

Secondary bacterial infections complicating LSDV skin lesions were documented in 34.6% of examined animals, with *Staphylococcus aureus* and *Corynebacterium pseudotuberculosis* being the most frequently isolated species. These secondary bacterial infections prolonged healing times by an average of 2–3 weeks and increased the probability of permanent scarring from 22.4% to 48.6%, indicating that management strategies to prevent secondary infection through good hygiene and anti-inflammatory care may substantially improve recovery outcomes.

Conclusion

Within the context of characterizing lumpy skin disease as an emerging transboundary threat, comprehensive understanding of the clinical and pathological spectrum in naturally infected cattle populations is essential for accurate disease recognition, prognostic assessment, and

management decision-making. This research documented the temporal progression of clinical manifestations in 156 naturally infected Ethiopian cattle, revealing a predictable 8–12 week disease course characterized by fever preceding visible lesions, progressive lesion development over weeks 3–6, and resolution over weeks 7–12 for most animals. The practical message is that field veterinarians and pastoral animal health workers should recognize that fever and systemic signs may precede visible skin lesions by up to a week, necessitating heightened surveillance sensitivity during prodromal phases. Future research should investigate the host factors determining disease severity and the impact of early supportive care interventions on lesion progression and recovery.

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