Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #:**184;** Month: **March;** Year: **2022**

Answer Sheet

Title: *Lumpy skin disease in a cow*

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Morphologic diagnosis:
Skin nodule: Dermatitis and panniculitis, necrotizing, subacute to chronic, multifocal, moderate to severe, with fibrino-necrotizing vasculitis, intra-epidermal vesicles, ballooning degeneration, frequent intra-histiocytic eosinophilic cytoplasmic inclusions and occasional intra-epithelial intracytoplasmic inclusion bodies

Etiologic diagnosis:
Capripoxviral dermatitis and panniculitis

Etiology:
Lumpy skin disease virus (LSDV)

Histologic findings
Skin nodule: Most severely affecting the deep cutaneous plexus in the deep dermis and subcutis, there are abundant inflammatory infiltrates centered on blood vessels with predominately macrophages, fibroblasts, fewer plasma cells, lymphocytes, and scattered cellular debris. The macrophages frequently contain a large, prominent eosinophilic or amphophilic, intracytoplasmic inclusion body and have marginated chromatin. Multifocally, affected vessels contain fibrin thrombi, and the vascular wall is partially or completely replaced by homogenous, brightly eosinophilic, fibrillar material (fibrin) with or without erythrocytes and necrotic debris (fibrinoid necrosis). Moderate to extensive areas of necrosis, haemorrhage, oedema, and/or fibrosis are often present in the tissue adjacent to the affected vessels, extending into the dermis and overlying epidermis in some lesions.

In areas that affect the epidermis, there is multifocal, mild to moderate acanthosis, moderate ballooning degeneration and spongiosis of the epidermis with the formation of subcorneal vesicles. Keratinocytes occasionally contain intracytoplasmic inclusion bodies, and sometimes individual or groups of cells are brightly eosinophilic with karyorrhexis, pyknosis or loss of nuclei (necrosis). The epidermis is additionally affected by occasional dermal-epidermal separation, erosion/ulceration/necrosis, with or without infiltration of neutrophils forming subcorneal abscesses, mild to moderate parakeratosis, as well as serocellular crusts. The underlying superficial dermis is affected by the previously described vasocentric changes with the occasional presence of melanophages (pigmentary incontinence).

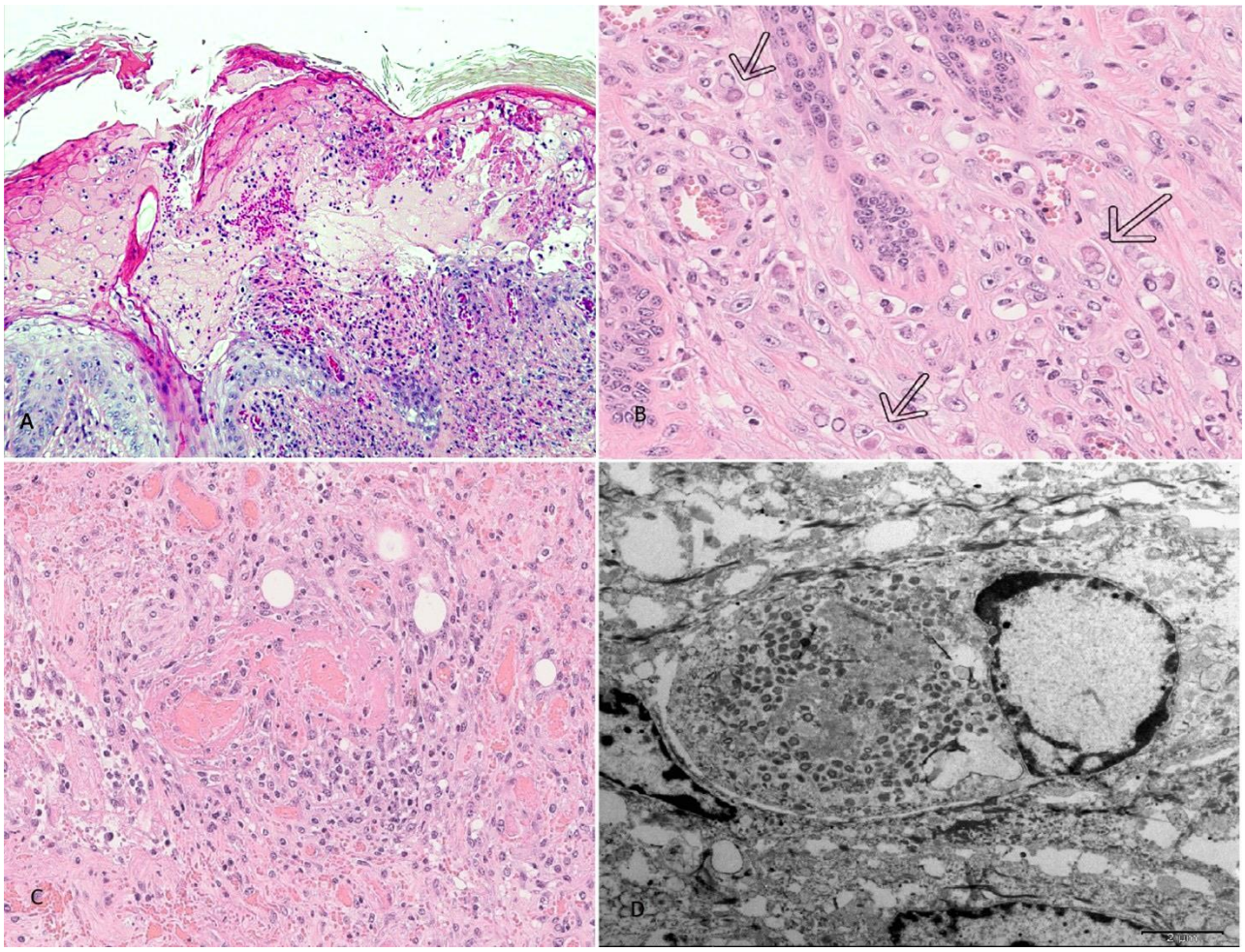

Figure 3.
A Intraepidermal veside
B Intrahistiocytic intracytoplasmic inclusion bodies (arrows)
C Fibrinoid necrosis of the dermal vasculature
D Transmission electron microscopy showing intracytoplasmic virions in macrophages

Discussion

Lumpy skin disease (LSD) is an infectious disease of cattle and water buffaloes caused by lumpy skin disease virus (LSDV), which belongs to the Capripoxvirus genus. The virus is mainly transmitted by mechanical transfer through biting insects. Therefore, LSD is more common in the summer and rainy weather. It is an emerging disease of cattle that is currently spreading throughout Asia and resulting in economic losses (1).

The characteristic clinical sign of LSD is the formation of well circumscribed, round nodules in the skin of the affected cattle. The nodules may also appear in nasal and buccal mucous membranes. Other clinical sings include emaciation, generalized lymphadenopathy, and subcutaneous edema (2).

Although the virus is introduced percutaneously, the infection is systemic. A leukocyte-associated viremia disseminates the virus to various tissues and infects a wide range of cells, including keratinocytes, mucous and serous

glandular epithelial cells, fibrocytes, skeletal myofibers, macrophages, pericytes, and endothelial cells. Damage to endothelial cells causes vasculitis, which is central to the pathogenesis (4). In a recent publication on experimental infection with LSDV in cattle, deep dermal vasculitis was shown to be the primary and key histopathologic features of LSD (5). This is consistent with the lesions seen in this naturally infected case. Another characteristic feature of LSD is the presence of intracytoplasmic, eosinophilic, homogeneous, and occasionally granular inclusion bodies in endothelial cells, pericytes, keratinocytes, macrophages, and fibroblasts; however, these inclusions are not always present (4, 5).

LSD can be clinically easily confused with pseudo-lumpy skin disease caused by bovine herpesvirus 2. Therefore, laboratory confirmation should be considered. Confirmation of LSD is most rapid using a real-time or conventional polymerase chain reaction (PCR) method specific for capripoxviruses in combination with the clinical history of a generalized nodular skin disease and enlarged superficial lymph nodes in cattle. Ultrastructurally, capripoxvirus virions are distinct from parapoxvirus virions, which causes bovine papular stomatitis and pseudocowpox, but cannot be distinguished morphologically from orthopoxvirus virions, including cowpox and vaccinia viruses, although neither causes generalized infection and both are uncommon in cattle (3).

References:

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5. Sanz-Bernardo B, Haga I, Wijesiriwardana N, Hawes P, Simpson J, Morrison L et al. Lumpy Skin Disease Is Characterized by Severe Multifocal Dermatitis with Necrotizing Fibrinoid Vasculitis Following Experimental Infection. Veterinary Pathology. 2020;57(3):388-396.