

Diagnostic Exercise

From The Davis-Thompson Foundation*

Answer Sheet

Case # **170** Month: **August** Year: **2021**

Title: *Bovine listeric encephalitis (encephalic listeriosis)*

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Clinical History: 4-year-old Holstein cow with a history of unilateral (right side) facial paralysis, keratitis, drooping of the right ear, head tilt, circling, stiffness of the right limbs, tremors, and recumbency.

Necropsy Findings: The left side of the brainstem was swollen, multiple coalescing areas of the neuroparenchyma in this region were soft, tan-brownish, and slightly depressed on cut section (malacia).

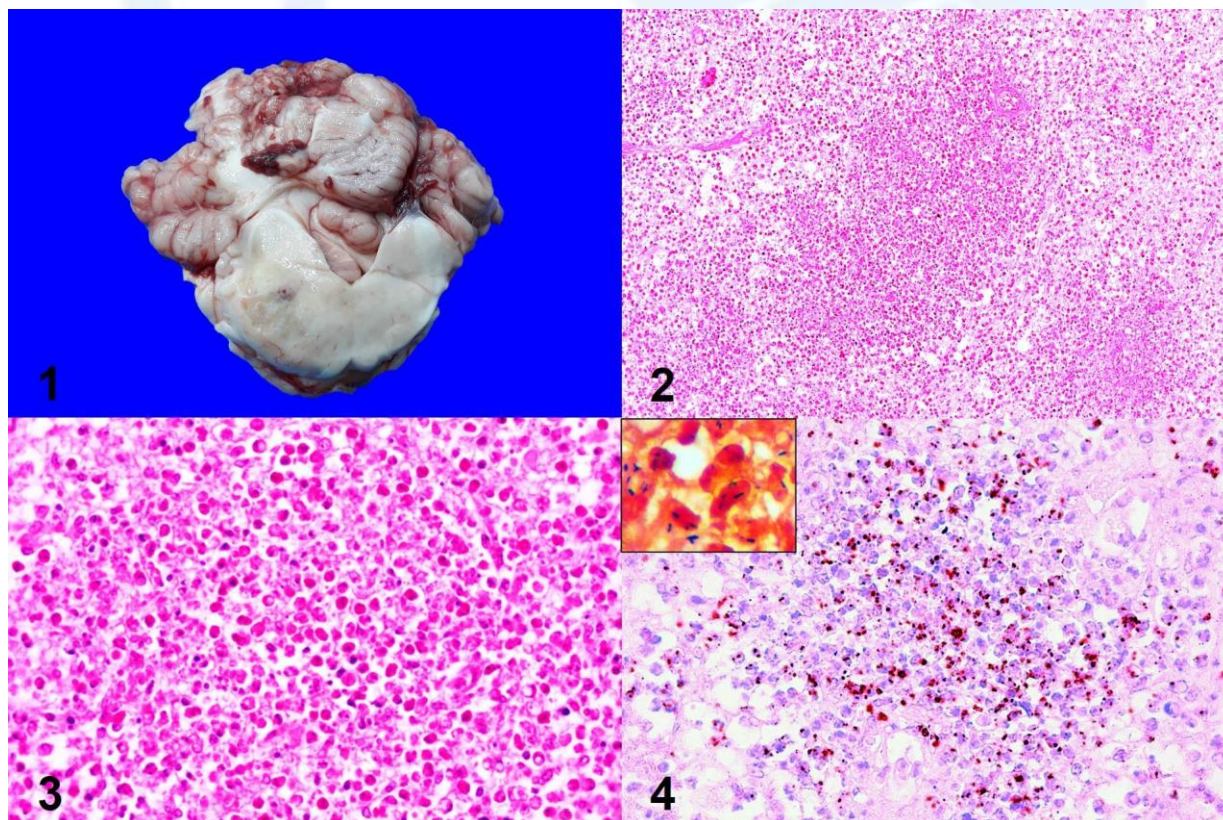


Figure 1: Cross section of the cerebellum and brainstem at the level of the pons depicting the lesions described as necropsy findings, caudal view. **Figure 2:**

Brainstem, hematoxylin and eosin (H&E), 20x. **Figure 3:** Brainstem, H&E, 20x. **Figure 4:** Immunohistochemistry, 40x. *Inset:* Gram stain, 50x.

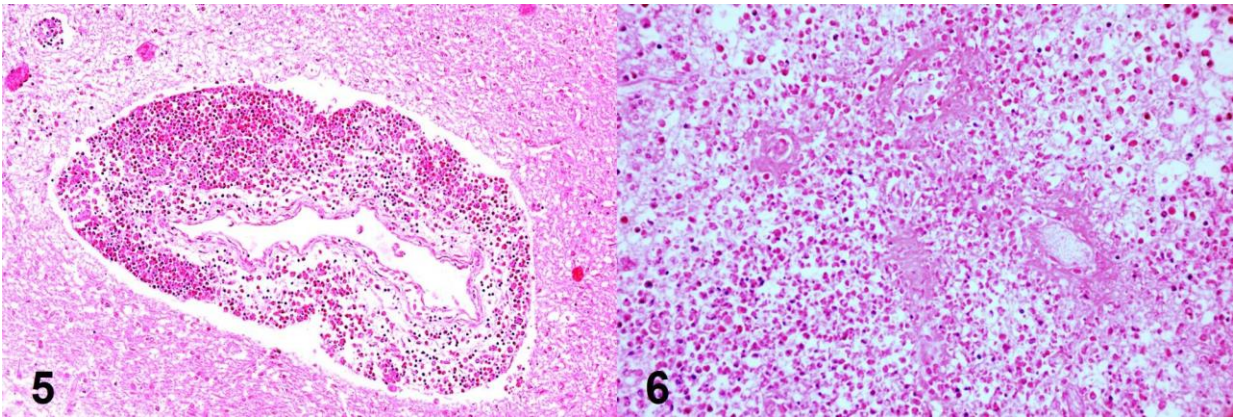


Figure 5: Brainstem, H&E, 20x. **Figure 6:** Brainstem, H&E, 40x.

Follow-up questions:

- (i) Morphologic diagnosis?
- (ii) Differential diagnosis/es?
- (iii) Etiologic diagnosis?
- (iv) cause?
- (v) Name of the disease.

Morphologic diagnosis:

Brainstem: Encephalitis, suppurative and necrotizing, multifocal to coalescing, subacute, severe, with numerous intralesional monomorphic Gram-positive bacilli, and occasional microthrombosis in venules entrapped within the areas of necrosis.

Differential diagnosis:

Thrombotic meningoencephalitis (TME)

Cause:

Listeria monocytogenes

Etiologic diagnosis:

Listeric encephalitis (encephalic listeriosis)

Name of the disease:

Listeriosis

Comments:

Clinical and pathological findings were highly compatible with listeric encephalitis. Etiologic confirmation was achieved through *L. monocytogenes* isolation and antigen detection by immunohistochemistry.

Listeria monocytogenes is a ubiquitous, Gram-positive, facultatively anaerobic bacillus (Low & Donachie 1997). Although it can affect various species, listeriosis is mainly a disease of ruminants, encephalitis being the most common clinical form (Walland et al. 2015). Other clinical presentations include septicemia, abortion, mastitis, keratoconjunctivitis, and enteritis (Low & Donachie 1997, Walland et al. 2015). Usually, the route of entry is through the ingestion of contaminated feed (Walland et al. 2015). Encephalitis is caused after the bacteria invade the injured oral mucosa and migrate centripetally through the brain's cranial nerves (Charlton and García 1977).

Encephalic lesions caused by *L. monocytogenes* can be undetectable upon gross examination, although in some cases, such as the one described herein, they can be remarkable. Histologically, microabscesses are characteristic of listeric encephalitis (Cantile and Youssef 2015). Occasionally, venules may exhibit necrosis, sometimes with perivascular hemorrhages and leaking of fibrinous exudate (Oevermann et al. 2010, Cantile and Youssef 2015); these lesions frequently occur in severe cases in vessels that are entrapped within extensive areas of neuroparenchymal necrosis rather than resulting from primary vascular injury (Oevermann et al. 2010, Cantile and Youssef 2015). Differentials from these vascular changes occasionally seen in listeriosis cases include similar lesions found in thrombotic meningoencephalitis (TME) caused by the gram-negative bacillus *Histophilus somni*. However, vasculitis with secondary thrombosis in the thalamus and cerebral cortex, which very often result in grossly visible foci of malacia and hemorrhage, are the pathologic hallmarks of TME (Cantile and Youssef 2015). Histologically, dense colonies of *H. somni* can be observed both on H&E and Gram stains. Malignant catarrhal fever (MCF), most commonly caused by ovine gammaherpesvirus-2, should be considered a clinical differential diagnosis of encephalitis in cattle, although from the histopathologic stand point the encephalic lesions are mainly characterized by fibrinoid necrosis and mural inflammation affecting arterioles, with accompanying perivascular accumulation of lymphocytes, macrophages, and plasma cells (Uzal et al. 2015), these changes are distinctive features between MCF and listeriosis. Also, MCF-affected animals often exhibit conjunctivitis, corneal edema, fibrinoid arteriolitis in several other tissues, lymphocytic hyperplasia, erosive/ulcerative rhinitis with serous exudation, fibrinous tracheobronchitis, erosions/ulcers in the upper alimentary mucosa, nonsuppurative interstitial nephritis, and erosive/ulcerative urocystitis (Uzal et al. 2015). Other viral causes of encephalitis such as bovine astrovirus and bovine alphaherpesvirus-1 or -5 are also characterized by nonsuppurative inflammation, and in the case of alphaherpesviruses the eventual occurrence of intranuclear viral inclusion bodies, which allow for differentiation with bacterial encephalitis typically characterized by neutrophilic inflammation (Cantile and Youssef 2015).

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