Diagnostic Exercise
From The Davis-Thompson Foundation*

Case #: **157** Month: **January** Year: **2021**

Title: *Bovine, brain, viral meningoencephalitis (rabies)*

Contributors: Eryca Ceolin Lamego*, DVM, MS candidate (erycalamego@gmail.com), Alex dos Santos*, DVM, MS, PhD candidate, Glaucia D. Kommers*, DVM, MS, Doctor in Veterinary Pathology, Mariana Martins Flores*, DVM, MS, Doctor in Veterinary Pathology. *Laboratory of Veterinary Pathology, Universidade Federal de Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brazil.

Clinical History: A 3-year-old Angus bull had a six-day history of weakness, absent ruminal motility, hind limb paralysis, paddling movements and opisthotonos, progressing to spontaneous death. Other animals from nearby farms had died with similar clinical signs in the last months.

Necropsy Findings: The practicing veterinarian performed the necropsy in the field and sent the whole brain fixed in 10% formalin for examination at our lab. There were no gross changes in the brain. Representative histological findings are in Figures 1 and 2.

Microscopic Images:

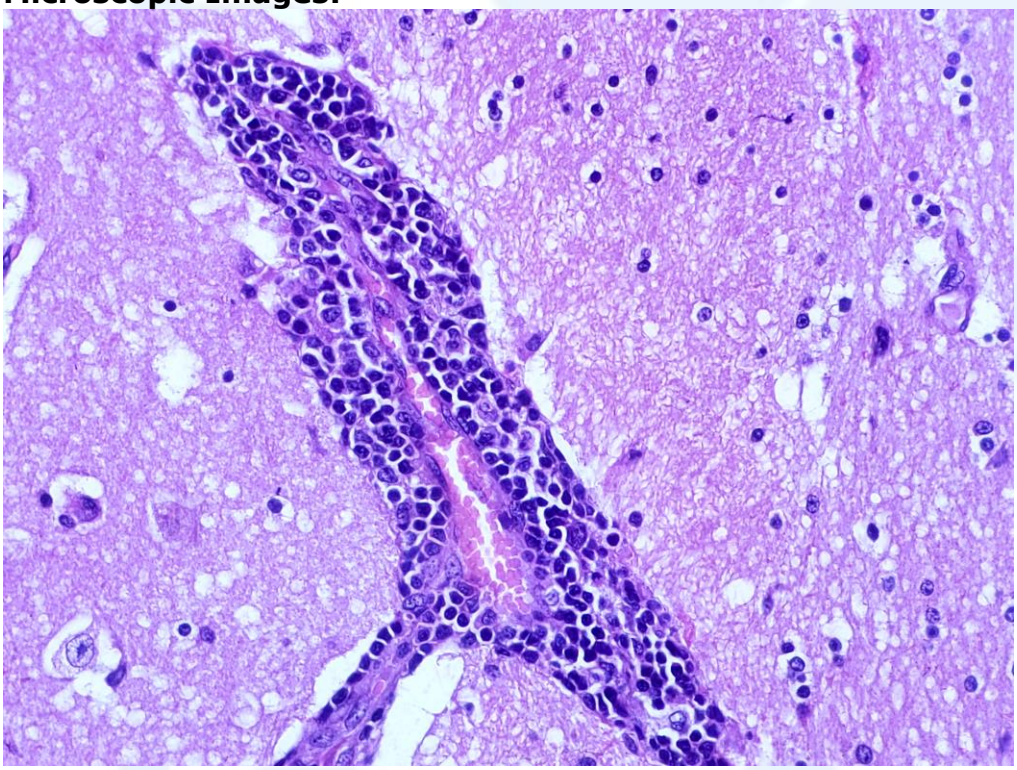

Figure 1

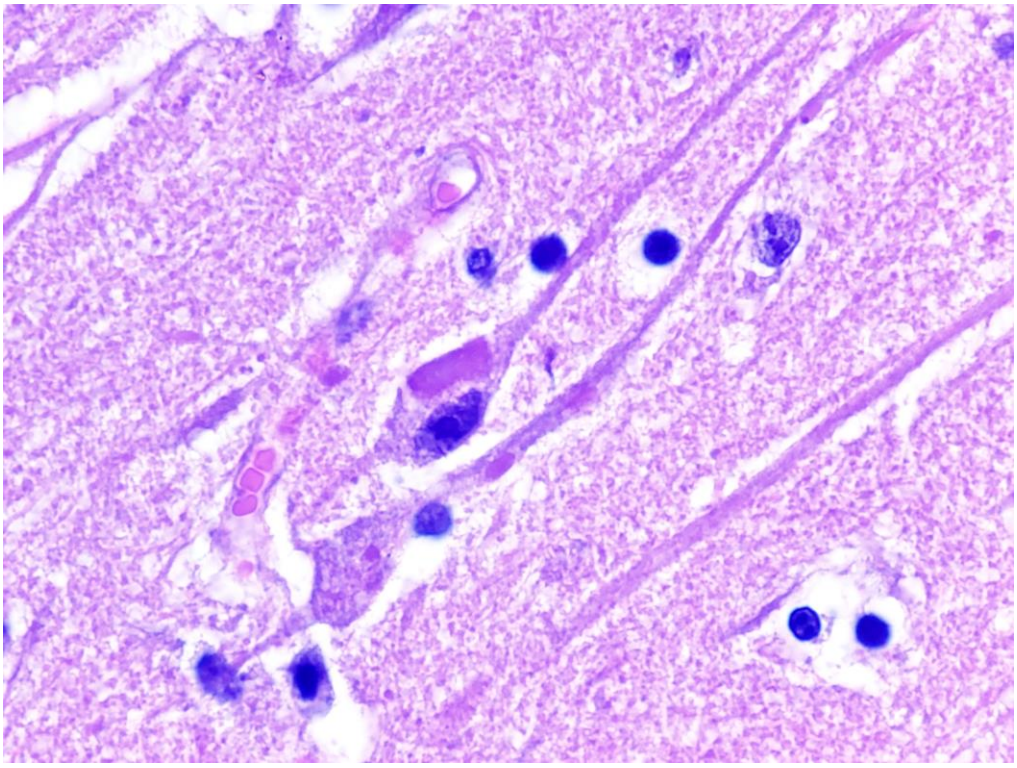

Figure 2

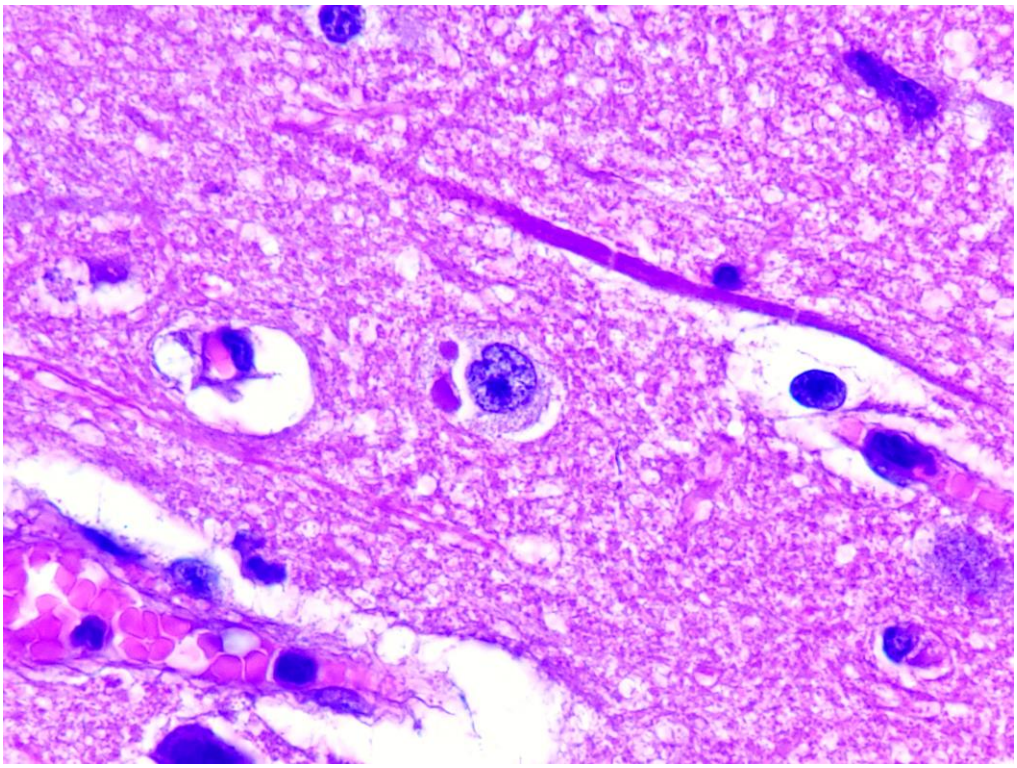

Figure 3

Diagnosis: Brain (frontal lobe, parietal lobe, occipital lobe, mesencephalon, basal nuclei, thalamus and cerebellum), meningoencephalitis, lymphoplasmacytic, multifocal, moderate, with neuronal acidophilic intracytoplasmic inclusion bodies (Negri bodies).

Typical gross findings: Although rabies does not cause any specific gross lesions in the central nervous system, hyperemia of the leptomeningeal vessels is commonly observed. Additionally, secondary changes such as aspiration bronchopneumonia and urinary bladder distention may be observed, and are nonspecific findings attributed to neurologic disfunction (Barros et al. 2006).

Typical microscopic findings: The histologic changes of rabies are typical of nonsuppurative meningoencephalomyelitis, which may be accompanied by ganglioneuritis (Cantille and Youssef 2016). In this case, multiple meningeal and encephalic blood vessels were surrounded by inflammatory cells, predominantly lymphocytes and plasma cells (perivascular cuffing). Several neurons from different brain regions contained one or multiple round to oval, 1-5 µm diameter, eosinophilic inclusions. These inclusions were most frequent in the Purkinje cells. Focal gliosis was also seen in the affected areas.

Discussion: Rabies is a zoonosis caused by a *Lyssavirus* that affects several domestic and wild animals (Cantille and Youssef, 2016). It is one of the most frequent neurological diseases in Brazilian cattle. Ruminants are usually infected by the bite of infected blood-sucking bats and are considered terminal hosts. Clinically, cattle develop a ”paralytic” presentation of the disease, with hypersalivation, tenesmus, opisthotonos, incoordination, paralysis, hypoesthesia of the pelvic limbs and flaccid paralysis of the tail with acute evolution to death. Clinical signs such aggressiveness and other behavioral disorders are unusual in vampire bat-induced rabies in cattle (Barros et al. 2006). Specific lesions are restricted to microscopy; however, leptomeningeal hyperemia in the central nervous system (CNS) and aspiration pneumonia are common nonspecific gross findings. Histologic lesions affect mostly the brain stem, cerebellum, spinal cord, and trigeminal ganglion. These lesions are characterized by lymphoplasmacytic inflammation of the CNS and meninges (meningoencephalitis) with perivascular cuffing and intracytoplasmic acidophilic inclusion bodies (Negri bodies) in neurons. Lymphoplasmacytic ganglioneuritis may also be observed. Viral etiology can be confirmed by direct immunofluorescence (gold standard), molecular testing (PCR), and immunohistochemistry (Barros et al. 2006, Cantille and Youssef 2016). The main differential diagnosis for clinical neurological disease in cattle from Southern Brazil are herpesviral types 1 and 5 (BoHV-1 and BoHV-5), malignant catarrhal fever (MCF), cerebral babesiosis and hepatic encephalopathy secondary to cirrhosis due to *Senecio brasiliensis* intoxication (Sanches et al. 2000). Herpesviral meningoencephalitis differs from rabies by the presence of malacia and by the location of viral inclusions bodies, which are intranuclear. The most important histologic feature of MCF is the presence of mononuclear arteritis in multiple tissues, including brain and *rete mirabile*, which is not a feature of rabies (Sanches et al. 2000). The other two diseases are included in our list of differential diagnoses

because of their high incidence in our geographic region; however, microscopic lesions are non-inflammatory and therefore distinct of viral diseases.

References:

Barros C.S.L., Drimeier D., Dutra I.S. & Lemos R.A.A. 2006. Doenças do Sistema Nervoso de Bovinos no Brasil. Coleção Vallée. São Paulo, p. 21-27.

Cantille C. and Youssef S. 2016. Nervous system: Lyssavirus infections, p. 367-370. In: Maxie M.G. (Ed) Jubb, Kennedy, and Palmer's Pathology of Domestic Animals**.** 6th. ed. Elsevier. Saint Louis.

Sanches A.D.W., Langohr I.M., Stigger A.L., Barros C.S.L. 2000. Diseases of the central nervous system in cattle of southern Brazil. Pesq. Vet. Bras. 20(3):113-118.

*The Diagnostic Exercises are an initiative of the **Latin Comparative Pathology Group (LCPG)**, the Latin American subdivision of The Davis-Thompson Foundation. These exercises are contributed by members and non-members from any country of residence. Consider submitting an exercise! A final document containing this material with answers and a brief discussion will be posted on the CL Davis website (http://www.cldavis.org/diagnostic_exercises.html).

Associate Editor for this Diagnostic Exercise: Mariana M. Flores
Editor-in-chief: Claudio Barros.