Diagnostic Exercise

From The Davis-Thompson Foundation*

Answer sheet

Case #: **175**; Month: **October**; Year: **2021**

Title: Oleander (*Nerium oleander*) intoxication in a bison

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Clinical History: Two 18-month-old female bison and a heifer died suddenly in the same ranch. The three animals were submitted for postmortem examination and diagnostic workup. The changes of one of the bison are presented here.

Necropsy Findings: The carcass was in fair nutritional condition, with small amount of fat reserves, but still well fleshed, and in mild state of post-mortem decomposition. There was a small amount of clotted dark-red blood in the nostrils and anus. The heart presented extensive sub-endocardial hemorrhages in all four chambers. These lesions were most pronounced in both ventricles where they extended deep into the underlying myocardium (Figs. 1 and 2). The mucosa of the abomasum was diffusely and mildly congested, and the mucosa of the small and large intestine was diffusely and severely congested (Fig. 3). There was a moderate amount of red fluid in the lumen of the small intestine, cecum, and colon. Both lungs had a few, small, well-delineated, deep, firm, multifocal dark-red areas in all pulmonary lobes, but lung tissue samples floated when placed into formalin.

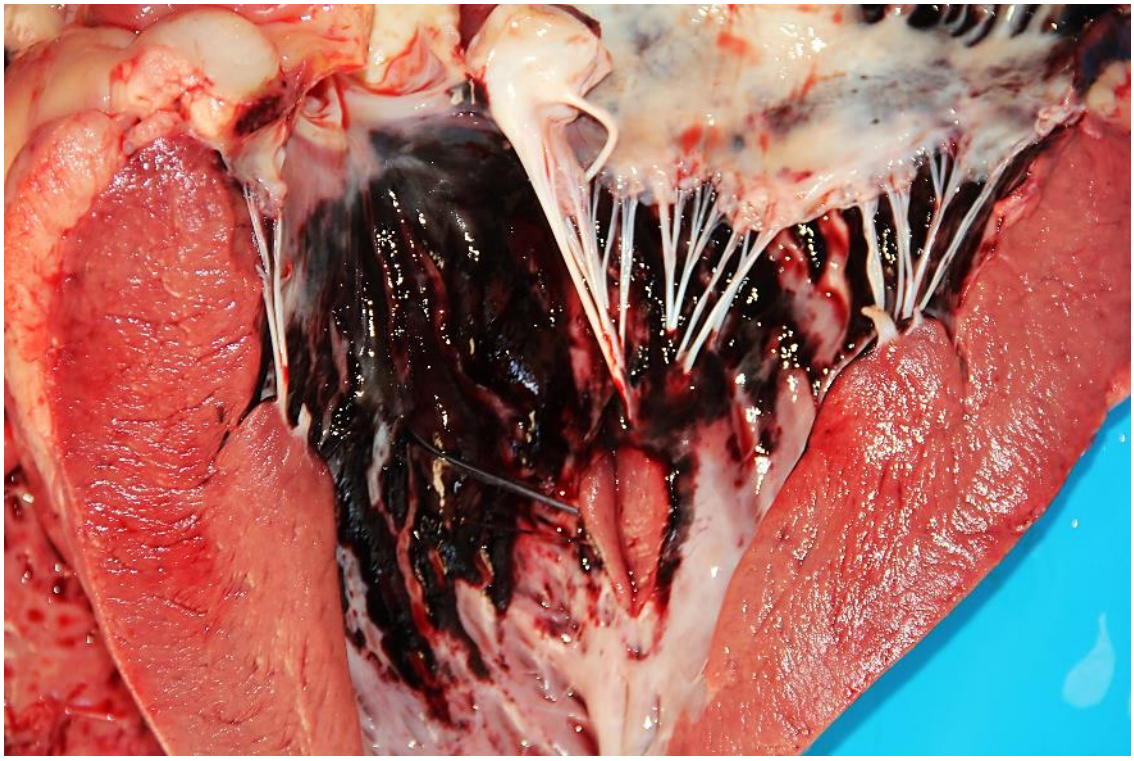

Figure 1.

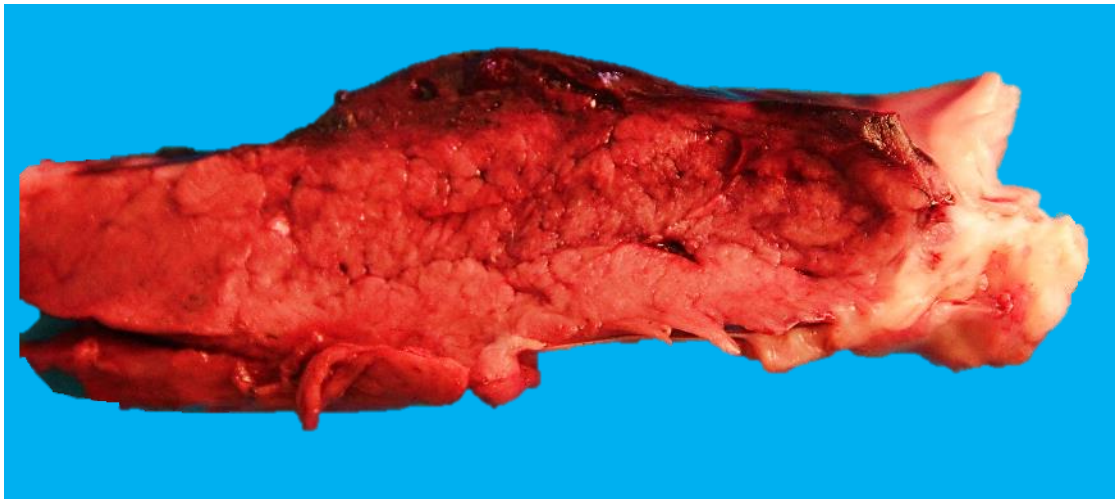

Figure 2.

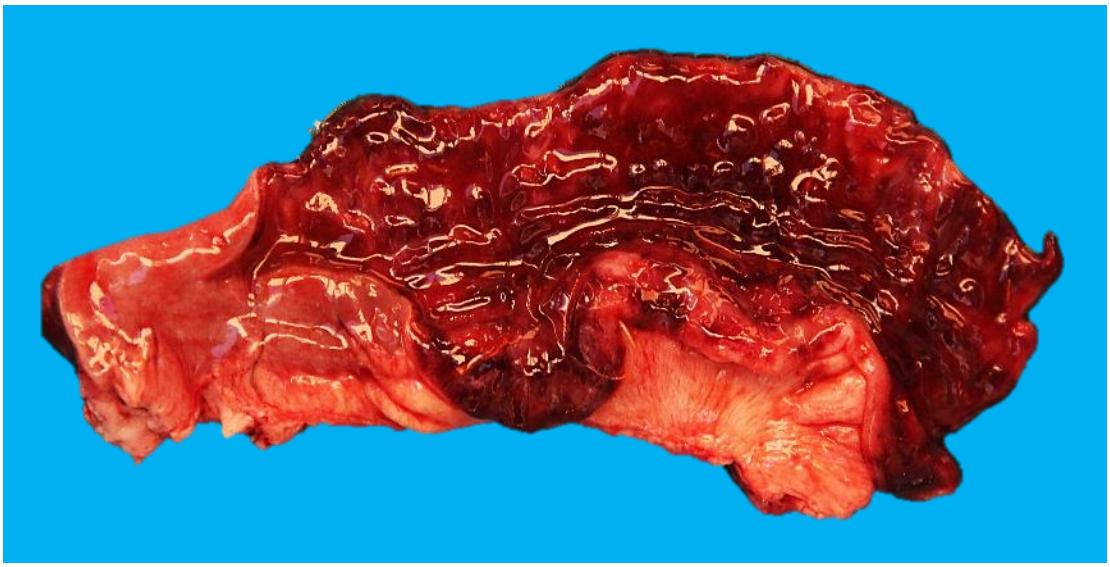

Figure 3.

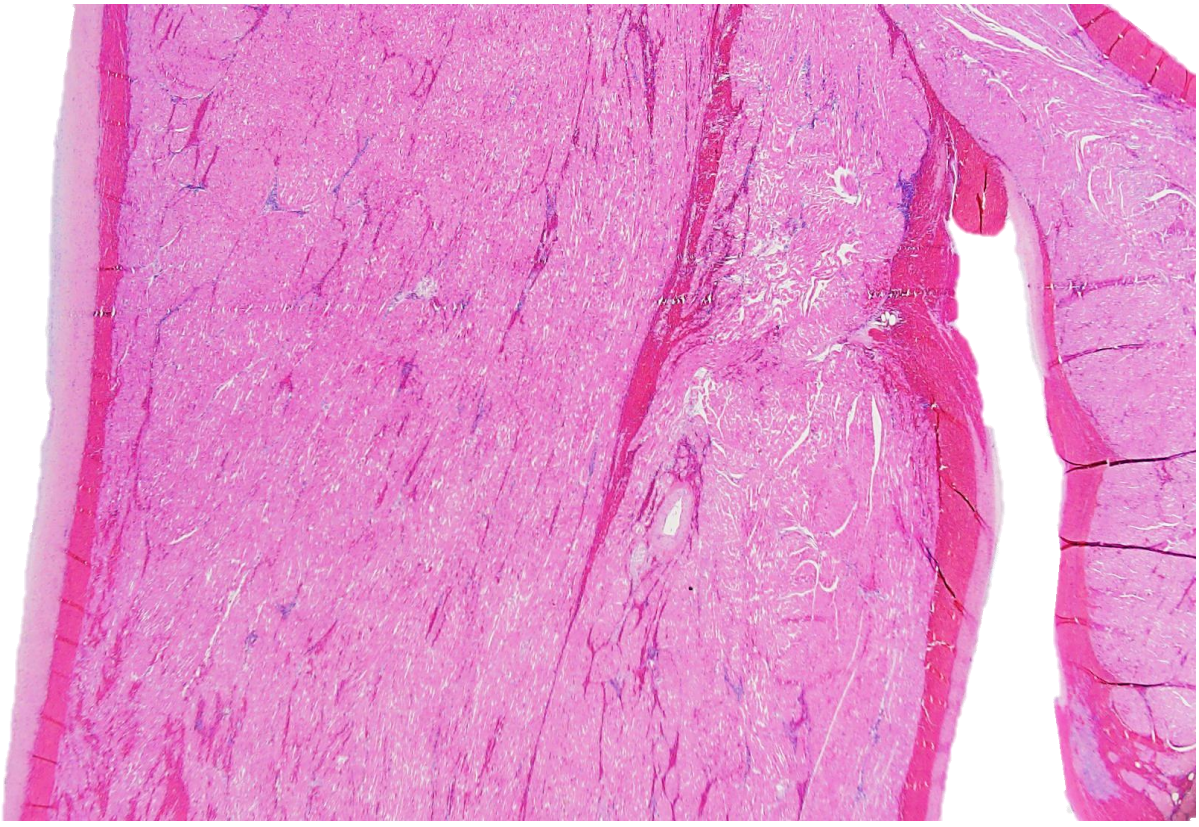

Figure 4. HE

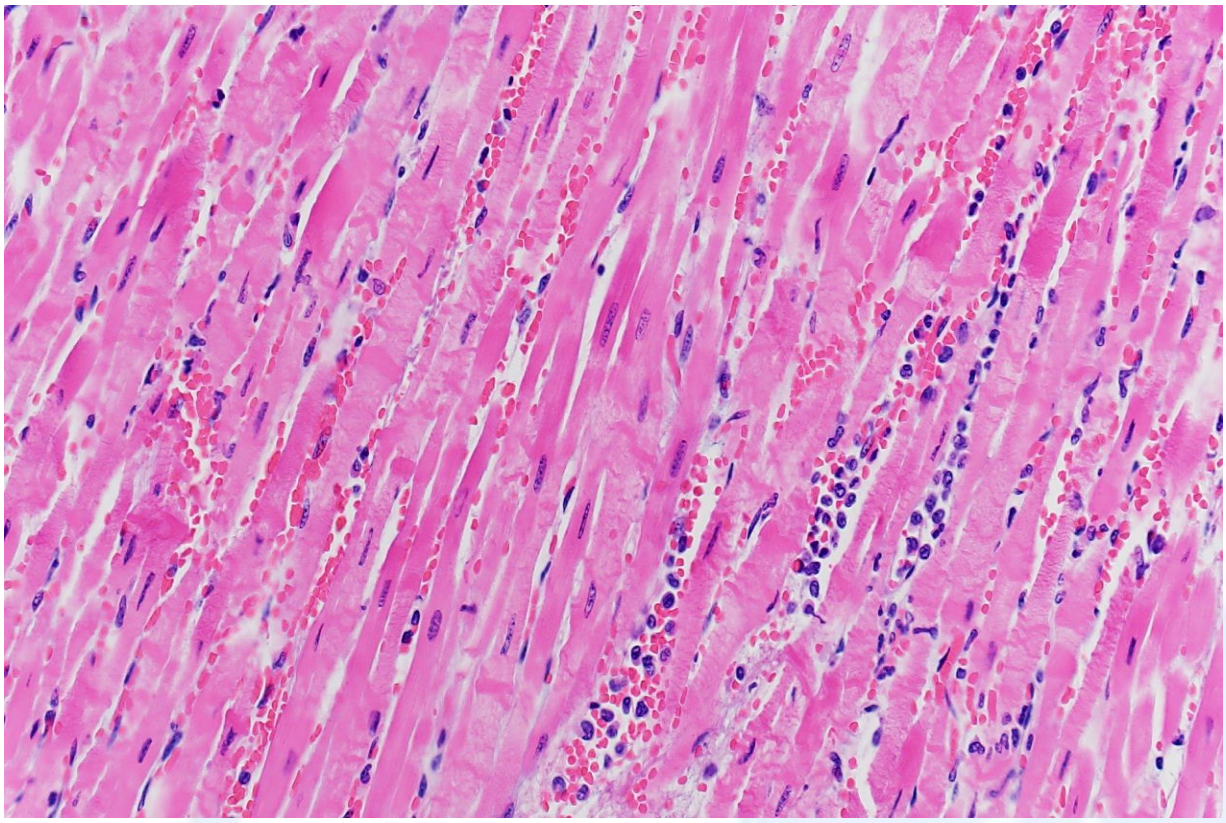

Figure 5 HE

Follow up questions:

1- Microscopic description:

Heart: Extensive areas of hemorrhage admixed with fibrin, edema, and moderate number of neutrophils, lymphocytes, plasma cells and fewer macrophages are multifocally present in the myocardium; these changes are most marked in subendocardial and subepicardial myocardium. The myofibers in these areas have one or more of the following changes: fragmentation, hypercontraction bands, hypereosinophilia, lack of cross striations, vacuolation, and pyknosis (cardiomyocyte degeneration and necrosis) (Figs. 4 and 5). Thrombi are occasionally seen within the areas of hemorrhage.

2- Morphologic diagnosis:

Myocardial degeneration and coagulative necrosis, severe, multifocal, monophasic, subacute, with multiple foci of hemorrhages and pleocellular leukocyte infiltration

3- Most likely etiology:

Nerium oleander (oleander) intoxication

Comments:

Oleandrin (the toxic principle of *Nerium* oleander –oleander-) was detected in liver, and in rumen and colon contents via ancillary testing [liquid chromatography with tandem mass spectrometry (LC-MS)], which, coupled with the gross and microscopic lesions, confirms the diagnosis of oleander poisoning. The source of oleander was the waste of plant clippings present in the ranch to which the animals had accidental access. There are no available descriptions of oleander intoxication in American bison in the scientific literature. In this case, the other two animals submitted for necropsy together with this animal from the same ranch, were also confirmed to have died of oleander poisoning. The clinico-pathologic presentation in the two bison was much more hemorrhagic than in the heifer, with abundant blood oozing from body orifices due to severe gastrointestinal hemorrhage, which initially had prompted a suspicion of anthrax.

Other causes of myocardial necrosis such as ionophore and gossypol poisoning, vitamin E/Selenium deficiency and several viruses (bluetongue, bovine coronavirus, border disease, epizootic hemorrhagic disease, infectious rhinotracheitis and malignant catarrhal fever) were considered during the diagnostic process but were ruled out based on history and specific testing for most of those agents. Additional ancillary testing included aerobic culture (negative), *Salmonella* spp. culture (negative) and heavy metal screen, which was unremarkable, except for low copper levels, a change that was considered incidental.

References and Recommended literature:

1- Galey FD, Holstege DM, Plumlee KH, Tor E, Johnson B, Anderson ML, Blanchard PC, Brown F. Diagnosis of oleander poisoning in livestock. J Vet Diagn Invest. 1996 Jul; 8(3):358-64. doi: 10.1177/104063879600800314. PMID: 8844581.
2- Robinson WF, Robinson NA. Cardiovascular system. In: Maxie MG, ed. Jubb, Kennedy and Palmer's Pathology of Domestic Animals. Vol 3. 6th ed. Philadelphia, PA: Elsevier Saunders; 2016: 34-39.
3- Rubini S, Rossi SS, Mestria S, Odoardi S, Chendi S, Poli A, Merialdi G, Andreoli G, Frisoni P, Gaudio RM, Baldisserotto A, Buso P, Manfredini S, Govoni G, Barbieri S, Centelleghe C, Corazzola G, Mazzariol S, Locatelli CA. A Probable Fatal Case of Oleander (Nerium oleander) Poisoning on a Cattle Farm: A New Method of Detection and Quantification of the Oleandrin Toxin in Rumen. Toxins (Basel). 2019 Jul 25;11(8):442. doi: 10.3390/toxins11080442. PMID: 31349685; PMCID: PMC6723884.
4- Varga A, Puschner B. Retrospective study of cattle poisonings in California: recognition, diagnosis, and treatment. Vet Med (Auckl). 2012 Nov 14; 3:111-127. doi: 10.2147/VMRR.S28770. PMID: 30155434; PMCID: PMC6065581.

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