



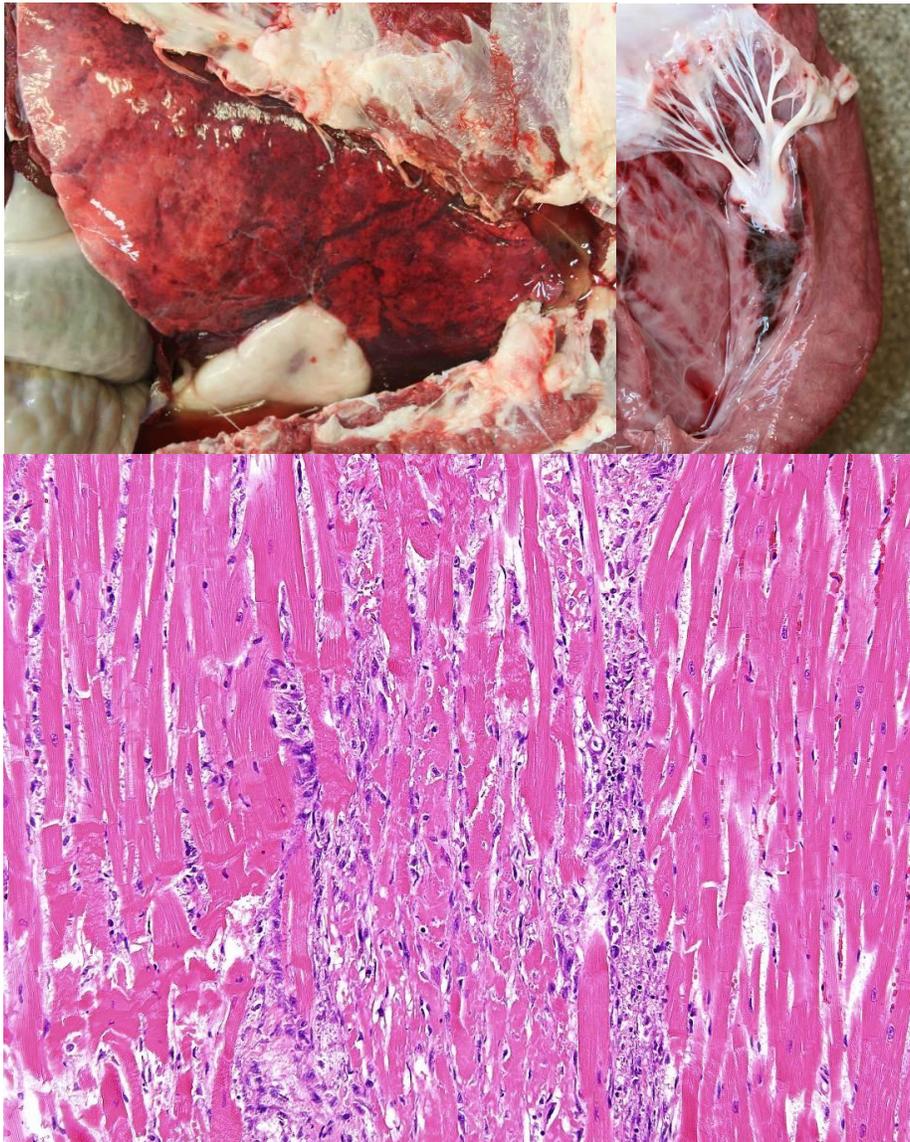
Latin Comparative Pathology Group

The Latin Subdivision of the CL Davis Foundation

Diagnostic Exercise

Case #: 34 Month: July Year: 2013

Answer Sheet



Bottom image: Heart. H&E stain, 20x.

Diagnosis: Oleander (*Nerium oleander*) poisoning.

Morphologic diagnosis (heart, lung, small intestine):

1. Myocardial degeneration and necrosis, acute, multifocal, (variable severity), with/without subendocardial hemorrhage.
2. Pulmonary edema, diffuse, acute/subacute.
3. Small intestine, hemorrhagic contents (not really an "enteritis").

Possible cause/s: Oleander poisoning.

Other frequently affected organ: Kidneys can be affected in some cases, either as a consequence of heart failure and/or direct toxic effect of Oleandrin on renal tubules (this needs further investigation). Hepatic passive congestion may be another non-specific finding.

Associated clinical pathology: Hyperglycemia, high BUN and Creatinine (azotemia) are the most common clinicopathological abnormalities in South American camelids (Kozikowski 2009).

Typical Gross findings: Gross findings vary from case to case depending on the amount of Oleandrin toxin ingested, duration of illness (peracute/acute/subacute), carcass preservation, etc. Natural cases often present with a combination of the following important gross findings:

1. Subendocardial/epicardial hemorrhage, especially along the papillary muscles of the left ventricle -photo above-.
2. Serous or serofibrinous hydropericardium and/or hydrothorax -photo above-.
3. Pulmonary edema, with diffusely expanded, meaty, sometimes congested lungs and often with a lot of foam in the trachea and major airways.
4. Fluid and hemorrhagic small intestinal contents (usually positive for blood/hemoglobin with reagent strip). This is a fairly non-specific finding in South American camelids that sometimes can mislead the diagnostician to think about a primary intestinal problem. Histology most of the time is fairly unremarkable, even in fresh carcasses, with little else than sloughing of mucosal epithelium (denuded villi) and some mucosal/submucosal hemorrhage.

Typical microscopic findings: The classical histological lesion compatible with Oleander poisoning occurs in the heart (photo). Multiple sections of heart (at least 4-5), including the papillary muscles of both ventriculi, should be examined to increase the chances of finding the characteristic lesions, which many times are multifocal and easy to miss if the right sections are not examined. Typically, peracute/acute cases have multifocal, acute degeneration and contraction band necrosis. Subacute cases will also have degeneration and necrosis, but a few to moderate numbers of neutrophils and histiocytes may infiltrate the interstitium of affected areas. Occasionally, there is mineralization of the degenerate or necrotic cardiomyocytes. In addition to the heart, lesions can be seen in the lungs (pulmonary edema) and kidneys (acute tubular degeneration and necrosis).

Discussion: *Nerium oleander* is widely spread throughout California and Oleander poisoning is one of the leading toxic causes of sudden death in horses and South American camelids at our diagnostic laboratory. If the amount of plant (and therefore toxin) ingested is high, animals usually die without any clinical signs reported or die after a short period of acute respiratory distress. With lesser amount of toxin ingested, nonspecific clinical signs similar to those expected from overdose of most cardiac glycosides may occur. These include anorexia, diarrhea, lethargy, and respiratory problems. The clinical and clinicopathological effects of oleander toxicosis in South American camelids has been previously documented (Kozikowski 2009; see reference below). In this paper, they describe an association between oleander toxicosis and a triad of clinical effects, typical of renal, gastrointestinal and cardiovascular dysfunction. The authors of this article believe that there is a direct toxic effect of Oleandrin toxin on the renal tubules, as the azotemia in most animals investigated in that article was thought to be too high to be only pre-renal azotemia (secondary to cardiac failure). A retrospective search of our database shows that most natural cases have significant lesions in the heart and only some have mild to moderate acute lesions in the kidneys (unpublished data). Further investigations are warranted to try to determine whether Oleandrin has a direct toxic effect on the renal tubular epithelium of South American camelids or not. It is also possible that the severe azotemia present may be a combination of pre-renal and renal azotemia. Some experimental studies indicating that Oleandrin has a direct renal toxic effect in sheep have been performed. It appears that acute renal failure is also a feature of oleander intoxication in goats and equids. In contrast, renal disease does not appear to be a consistent complication of oleander intoxication in humans.

Oleander poisoning in South American camelids should be suspected based on the clinical history of sudden death or other non-specific clinical signs (see above) and gross pathology. The presence of acute myocardial degeneration and

necrosis, although very characteristic and suggestive of intoxication, is not confirmatory. Therefore, detection of Oleander leaves and/or Oleandrin toxin in gastrointestinal contents are necessary to confirm intoxication.

References and Recommended literature:

Tania A. Kozikowski, DVM, DACVIM; K. Gary Magdesian, DVM, DACVIM, DACVECC, DACVCP; Birgit Puschner, DVM, PhD, DABVT Oleander intoxication in New World camelids: 12 cases (1995-2006)

Galey FD, Holstege DM, Johnson BJ, et al. Toxicity and diagnosis of oleander (*Nerium oleander*) poisoning in livestock. In: Garland T, Barr AC, eds. *Toxic plants and other natural toxicants*. York, England: CAB International, 1998.

Ada SE, Al-Yahya MA, Farhan AH. Acute toxicity of various oral doses of dried *Nerium oleander* leaves in sheep. *Am J Chin Med* 2001;29:525-532.

Oryan A, Maham M, Rezakhani A, et al. Morphological studies on experimental oleander poisoning in cattle. *Zentralbl Veterinarmed [A]* 1996;43:625-634.

Aslani MR, Vovassaghi AR, Mohri M, et al. Clinical and pathological aspects of experimental oleander (*Nerium oleander*) toxicosis in sheep. *Vet Res Commun* 2004;28:609-616.

Barbosa RR, Fontenele-Neto JD, Soto-Blanco B. Toxicity in goats caused by oleander (*Nerium oleander*). *Res Vet Sci* 2008;85:279-281.

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