Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #: **162** Month: **March** Year: **2021**

Title: Visceral gout and systemic amyloidosis in a Chilean flamingo (*Phoenicopterus chilensis*)

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Clinical History: An over 20-year-old, male Chilean flamingo (*Phoenicopterus chilensis*) from the Baton Rouge Zoo was lethargic and separated from the rest of the flock. Despite treatment for 24 hours, the bird remained recumbent and was later found dead. The vaccination history included for Eastern equine encephalitis virus and West Nile virus.

Necropsy Findings: The plantar surfaces of the feet had multiple, firm, raised, white to pale tan, ulcerated nodules ranging from 0.5 cm to 1.5 cm in diameter, consistent with chronic pododermatitis (Figure 1). Both kidneys were enlarged and diffusely yellowish orange with numerous white pinpoint foci throughout the parenchyma (Figure 2). The liver and spleen were enlarged, approximately 1.5 times of normal size. A focal white granular area was present on the ventral capsular surface of each hepatic lobe.

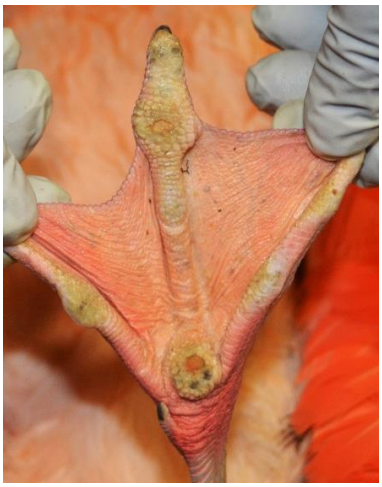


Figure 1

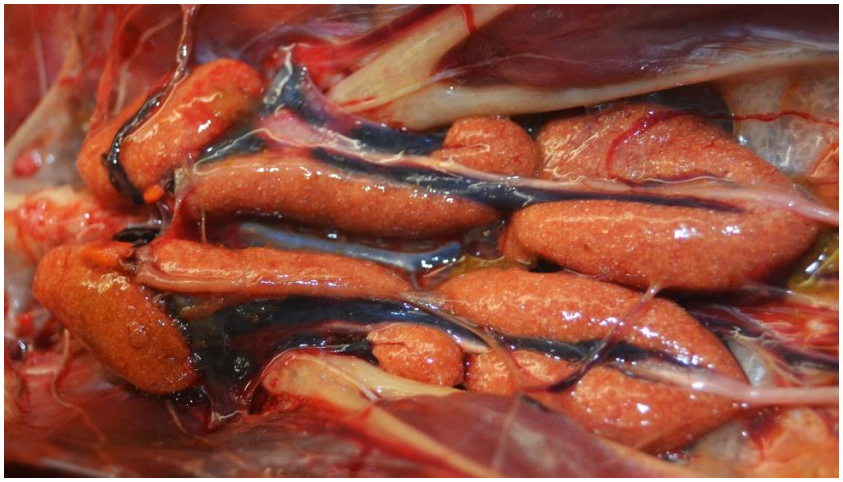


Figure 2

Follow-up questions:

- *Microscopic findings*
- *Morphologic diagnosis*
- *Name of the condition (s)*

Microscopic Findings: The renal tubules are multifocally replaced by lightly basophilic, radiating, sharp, crystalline deposits (Figures 3 and 4) surrounded by macrophages, multinucleated giant cells, and rare heterophils, compatible with urate tophi. The glomerular tufts, basement membrane of the renal tubules, interstitium, and vascular walls have moderate to marked deposition of amphophilic to basophilic, homogenous to fibrillar, acellular material (Figure 3), which is confirmed to be amyloid by Congo red stain revealing apple-green birefringence (Figure 3, inset). The renal tubules are often distorted and ectatic with attenuated epithelium and intraluminal proteinaceous casts. Severe amyloid deposition was also seen in the spleen and liver. Other organs exhibit lesser amounts of amyloid deposition, including the lungs, air sacs, proventriculus, small and large intestines, pancreas, and testes. Urate deposits are also noted on the hepatic capsule and in the stroma of air sacs.

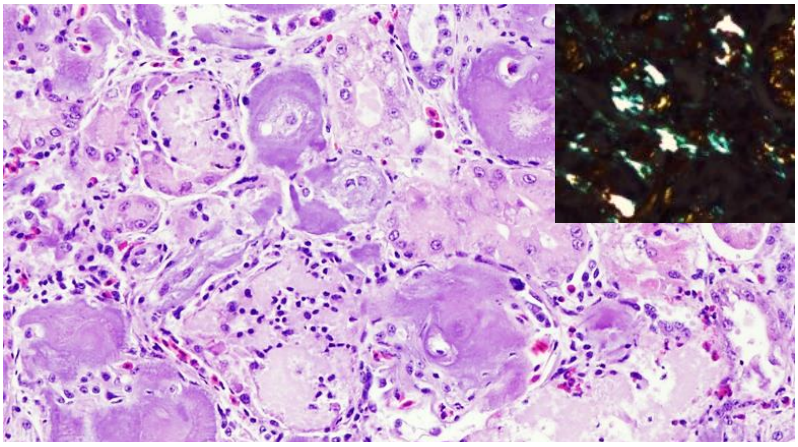
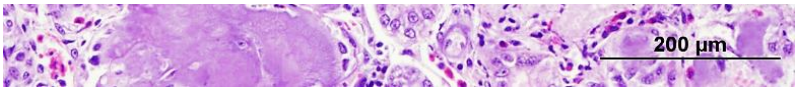


Figure 3: Kidney, H&E (inset: Congo Red stain under polarizer)



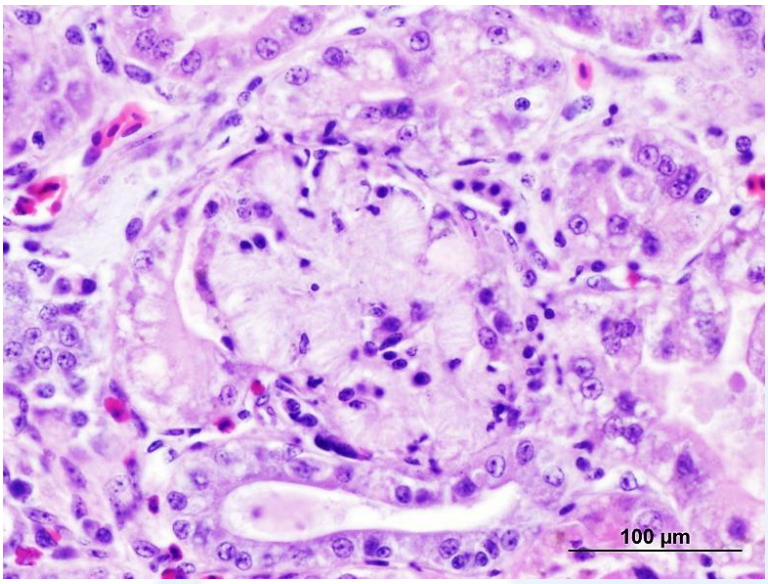


Figure 4: Kidney, H&E

Morphologic Diagnoses: Kidney: Nephritis, heterophilic and granulomatous, multifocal, with intralesional urate crystals (tophi); amyloid deposition, glomerular, interstitial and vascular, multifocal, moderate to severe

Conditions: Visceral gout and systemic amyloidosis

Discussion: Both pododermatitis (bumblefoot) and amyloidosis have been described in multiple captive avian species including flamingos (Cowen (1968). In flamingos, the types of flooring in water ponds and dietary zinc availability have been identified as possible risk factors for pododermatitis (Wyss et al. 2015), from which a hypha-forming bacterium, *Arsenicicoccus dermatophilus*, has been isolated (Gobeli et al. 2013). The majority of spontaneous amyloidosis cases in avian species have been determined to be due to amyloid protein A deposition or AA amyloidosis (Landman et al 1998, Tanaka et al. 2008). The pathogenesis of AA amyloidosis is not currently well understood; however, it has been shown that chronic inflammatory processes increase the serum concentration of serum amyloid A (SAA), the precursor protein of amyloid protein A. Pododermatitis is often reported to induce amyloidosis in waterfowl (Tanaka et al. 2008), as suspected in this case. The pathogenesis of visceral gout (urate deposition) has not been completely understood; however, it is generally associated with conditions that either reduce uric acid excretion or increase uric acid production (Speckmann and Luther 1974, Siller 1981). The cause of visceral gout in this case is suspected to be the renal amyloidosis, which likely induced functional renal failure.

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