

Department of Comparative, Diagnostic, and Population Medicine
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Case number: 576947; slide: AV67H

Presenter: Cynthia Santoro, University of Florida College of Veterinary Medicine, cboes@ufl.edu

Presenter title: Clinical Pathology Medical Laboratory Scientist

Collaborator: Shir Gilor, Jim Wellehan, University of Florida College of Veterinary Medicine

Case History

Signalment: Adult Mourning dove (*Zenaida macroura*), specific age and sex undetermined

History: The patient was found by a good Samaritan with an impaired ability to fly. He was presented to the University of Florida Zoological Medicine Service as a “wildlife donation”. On presentation the patient was quiet, alert, and responsive with normal posture. Physical examination revealed mild delayed ulnar refill time, consistent with mild dehydration and absence of primary, secondary, and tertiary flight feathers in a fashion supportive of trauma. The remaining plumage was in fair condition. Whole body radiographs were within normal limits. Chemistry results using benchtop Abaxis chemistry analyzer showed severe increase in creatin kinase (CK, 1,812 U/L) and mild increases in Aspartate Aminotransferase (AST, 262 U/L) and uric acid (UA, 12.3 mg/dL). The increased CK and AST were interpreted as muscle injury (e.g., trauma) and the elevated UA suggested mild dehydration. A complete blood cell count using heparinized whole blood was performed and no significant numerical abnormalities were noted.

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Case Synopsis

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Cytopathologic Description of Blood Smear Review: A slide-based estimate of approximately 16,300/uL white blood cells correlated well with the hemocytometer count with no evidence of inflammation. Low numbers of intracellular, variably pale blue-gray gametocytes (0-1 per 100x HPF) were observed. These had a range of developmental stages from small to medium, rounded to more elongated immature stages to the elongated, crescent-shaped, mature gametocytes. Mature gametocytes typically occupied more than half of the host erythrocyte cytoplasmic volume and partially encircled the nucleus, producing the characteristic “halter” shape, with minimal nuclear displacement. Most gametocytes at all stages contained refractile, yellow to brown pigment granules (hemozoin). Extracellular macrogametes were frequently observed, occasionally forming small aggregates; these were round and morphologically similar to the intraerythrocytic forms. Extremely rare extracellular small structures were also noted, characterized by a ring-like appearance with a magenta ‘center’ and a faint light blue rim.

Interpretation: Presence of hemoparasites, morphologically consistent with *Haemoproteus* or *Plasmodium* spp.

Confirmatory Testing: PCR testing of whole blood sample was performed by the Zoological Medicine Diagnostic Laboratory at the College of Veterinary Medicine University of Florida. Two *Haemoproteus* spp. were identified: *Haemoproteus multipigmentatus* and *Haemoproteus* sp. Isolate H_DMP1915 (GenBank: OR760414.1).

Cause: Subclinical dual infection of *Haemoproteus* spp.

Comment:

Haemoproteus spp. are protozoan hemoparasites transmitted by insect vectors and are commonly identified in a wide range of wild bird species. In most cases, infection is subclinical and detected incidentally on blood smear evaluation. However, clinical disease can occur and is more prevalent in certain species, including pigeons, or in birds with concurrent conditions that may result in immunosuppression. Pathogenicity is influenced by multiple factors, including parasite species and host health status. Cytomorphologic evaluation of blood smears does not allow reliable differentiation among *Haemoproteus* species or between *Haemoproteus* and *Plasmodium* spp. Although PCR is the most common confirmatory method, it is not routinely performed in wildlife, limiting data on geographically specific prevalence and co-infections. Co-infections may influence disease expression in

complex ways, sometimes reducing pathogenicity through competitive interactions, but often exacerbate disease outcomes¹.

Co-infection with two *Haemoproteus* spp. were identified in this case. *Haemoproteus multipigmentatus* primarily infects columbiform birds (pigeons and doves) and has been associated with significant disease in endemic species such as the Galápagos dove (*Zenaida galapagoensis*). It has also been reported to spill over into native passerine birds. Its distribution includes warm mainland regions such as Mexico, Guatemala, and Peru². To our knowledge, it was not reported in the United States, but it is closely related to *H. columbae*, a species that is widespread in this region. The second organism found was an un-named, *Haemoproteus* species, the first to correspond to a sequence that matches a previously submitted GenBank entry by Texas A&M from a mourning dove (*Zenaida macroura*).

Hemoproteus only appears in the peripheral blood of birds in the gametocyte stage. Occasionally, extraerythrocytic macrogametes and microgametes can be found in blood films, especially those made from the blood collected several hours prior to preparing the smear. The high numbers of extracellular macrogametes noted was unusual, especially for a fresh sample, and possibly indicates increased fragility of erythrocytes.

The primary clinical concern in this patient was the traumatic loss of flight feathers. Although hemoparasite infection was not associated with clinical signs, its potential impact on feather growth and quality is unclear. Limited studies suggest that infected birds may have shorter feathers, reduced growth rates, and increased growth bands^{2,3}, possibly due to competition for nutrients or diversion of resources to the immune response¹. However, other studies have found no association between hemoparasitism and feather quality⁴. Overall, the relationship remains poorly understood and warrants further investigation.

The loss of flight feathers, Impaired flight ability, and increased in muscle enzymes were likely the result of a physical trauma, suspect predation. Due to lack of systemic symptoms and inflammatory leukogram, the parasitic infection was considered subclinical and did not merit treatment. There was no follow up on record for this patient by the University of Florida Zoological Medicine Service after being discharged to a wildlife rehabilitation facility.

References:

1. Alvarado-Piqueras A, Gomez-Munoz MT, Martin-Maldonado B. Hemoparasites in wild birds: A systemic review of their ecology and clinical Implications. *Animals* 2025, 15, 2570. <https://doi.org/10.3390/ani15172570>
2. Jaramillo M, Rohrer S, Parker PG. From Galapagos doves to passerines: Spillover of *Haemoproteus multipigmentatus*. *Int J Parasitol Parasites Wildl*. 2017 Jul 4;6(3):155-161. doi: 10.1016/j.ijppaw.2017.07.001. PMID: 28736699; PMCID: PMC5510524.
3. Marzal A, Reviriego M, Hermosell IG, Balbontín J, et al. Malaria infection and feather growth rate predict reproductive success in house martins. *Oecologia*. 2013, 171:853–861. doi: 10.1007/s00442-012-2444-3
4. Huang X, Jönsson J, Bensch S. Persistence of avian haemosporidians in the wild: A case study to illustrate seasonal infection patterns in relation to host life stages. *Int. J. Parasitol*. 2020;50:611–619. doi: 10.1016/j.ijpara.2020.05.006