

# Bugs in the Blood: The Rise of Blood Parasites in Raptors

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**Abstract:** Two blood parasite diseases, avian malaria and babesiosis, are increasing in prevalence in raptor species. Avian malaria, the more commonly reported of the two, is documented as deadly; the severity of babesiosis is currently unknown. Routine evaluation of blood smears is critical to diagnosing these diseases so that appropriate treatment can be initiated and unexpected mortalities prevented.

**Keywords:** Avian malaria, babesiosis, blood parasite, raptor

## INTRODUCTION

As many raptor rehabilitators are aware, insects such as mosquitoes, louse flies, and biting midges can transmit parasites and disease to otherwise healthy birds. West Nile virus, still at the forefront of people's minds, is transmitted by mosquitoes in the genus *Culex*. Blood parasites, such as *Leukocytozoa* spp. and *Hemoproteus* spp., carried by biting flies, are commonly found in the blood of young and injured raptors. Two additional blood parasite diseases are now becoming more prominent in raptors: avian malaria and babesiosis.

## AVIAN MALARIA

Avian malaria is caused by mosquito-borne protozoan parasites that invade both blood and organ tissues during their developmental cycle. The protozoans are in the genus *Plasmodium*. The Raptor Center (TRC) in St. Paul, Minnesota has diagnosed avian malaria in several raptor species including: barred owls (*Strix varia*), broad-winged hawks (*Buteo platypterus*), Cooper's hawks (*Accipiter cooperii*), eastern screech owls (*Megascops asio*), great gray owls (*Strix nebulosa*), great-horned owls (*Bubo virginianus*), gyrfalcons (*Falco rusticolus*), merlins (*Falco columbarius*), northern saw-whet owls (*Aegolius acadicus*), osprey (*Pandion haliaetus*), and red-tailed hawks (*Buteo jamaicensis*). Avian malaria has been seen in all ages of raptors including nestling

birds. Based on clinical data, malaria prevalence has increased dramatically over the past two years in Minnesota, mainly during the mosquito season.

In raptors malaria can be the primary cause of admission, an incidental finding during a complete diagnostic work-up, or can lay dormant and surface during the rehabilitation process. Clinical signs may include anemia, often physically evidenced by pale mucous membranes; weight loss, lethargy, and bright green mutes. However, if diagnosed early in the infection cycle, these symptoms may not be evident.

Avian malaria can be diagnosed by identifying *Plasmodium* organisms in the red blood cells (Figure 1). The cells appear as pigmented bodies in the cytoplasm, often pushing the nucleus to one end of the cell. Thus, due to the fact that a complete blood count (CBC) can provide a great deal of health information, it should always be a routine component of any admission exam. Periodic CBCs throughout rehabilitation of a patient should also be taken to monitor the health status, and identify disease processes that arise during its stay in captivity, even if housed indoors. If malaria is not considered, diagnosed, and treated, it can be an unexpected cause of mortality in an individual being treated for a traumatic injury or an orphan raptor.

TRC currently treats avian malaria with mefloquine hydrochloride (Lariam<sup>®</sup>, Hoffman La Roche [Roche] Pharmaceuticals, Nutley, NJ). Lariam<sup>®</sup> is a human product that can be acquired at a local pharmacy by a licensed veterinarian. Lariam<sup>®</sup> comes in pill form and is dosed at 30 mg/kg. The key to treating a bird for avian malaria with Lariam<sup>®</sup> is that the drug must be administered on a strict time schedule in order to attack plasmodium organisms located in both the blood and organs. Thus, to promote its efficacy, Lariam<sup>®</sup> must be given at time 0-hours, 12-hours, 24-hours, and 48-hours. If a dose is missed or administration time strays from the schedule, some

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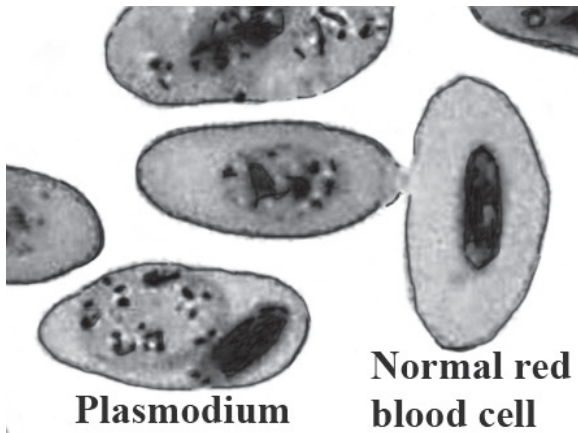


Figure 1. *Plasmodium* organisms in the cytoplasm of an avian red blood cell.

*Plasmodium* organisms may not be affected and the infection will continue and worsen.

### BABESIOSIS

A blood parasite disease that previously has been reported rarely in raptors is babesiosis. *Babesia* organisms are unicellular, non-pigmented protozoan parasites that, like *Plasmodium*, invade red blood cells and can cause their destruction. On a blood smear, *Babesia* is distinguished from *Plasmodium* by its non-pigmented nature and white vacuole (Figure 2).

Babesiosis is a disease not specific to birds; it also occurs in dogs and humans. The species of *Babesia* organisms reported specifically to infect raptors are *Babesia shortii* and *Babesia moshkovskii* (Pierce 2000; Merino et al 2002). However, in birds, relatively little is known about this disease. A few reports indicate

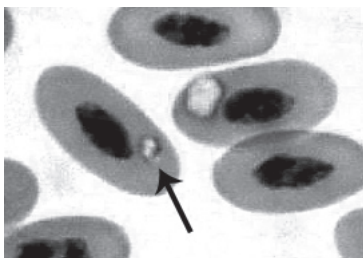


Figure 2. *Babesia* organism in the cytoplasm of an avian red blood cell.

that likely vectors are ticks in the genus *Ixodid* (same genus as deer ticks; Pierce 2000). TRC has identified *Babesia* in red-tailed hawks, Cooper's hawks, merlins, great-horned owls, one osprey, and one bald eagle (*Haliaeetus leucocephalus*). It has also been reported clinically in gyrfalcons, peregrine falcons (*Falco peregrinus*), saker falcon (*Falco cherrug* [Saudi Arabia]); prairie falcons (*Falco mexicanus* [USA]) and kestrels (*Falco tinnunculus* [Spain]; Pierce 2003; Munoz et al 1999). In a few of the cases presented to TRC, small ticks were present around the mouth and/or eyelids of birds at the time of admission; in the majority of cases however, ticks were absent (Figure 3). Ticks found on birds at admission to TRC were identified by the entomology lab at the University of Minnesota as *Ixodid scapularis* (deer tick, black-legged tick).

The clinical relevance of *Babesia* is unclear. Most often, raptors carrying a *Babesia* load also are suffering from traumatic injury or other infectious disease. Some birds even carry *Plasmodium* and *Babesia* at the same time. One study performed at the International Veterinary Hospital in Kuwait found that sick falcons diagnosed only with babesiosis, presented with symptoms that included closed eyelids, weight loss, lethargy, regurgitation, poor coordination, and poor flight performance (Tarello 2006). TRC has not witnessed a bird with babesiosis that did not have a concurrent problem. Like *Plasmodium*, *Babesia* organisms can be absent from an admission CBC, but appear later during rehabilitation.

Recommended treatment for this disease is imidocarb dipropionate (Imizol<sup>®</sup>, Schering-Plough Animal Health, Union, NJ) at a dose of 7 to 13 mg/kg




Figure 3. Ticks present on the eyelid of a red-tailed hawk (*Buteo jamaicensis*) diagnosed with babesiosis.

intramuscularly once a week for three weeks. This drug has a narrow margin of safety in most species and is known for side effects. Immediately following injection of imidocarb dipropionate, raptors treated at TRC often experienced increased lacrimation and salivation, and a mental dullness. These symptoms continued for one to two minutes and then subsided. One eyes (nestling) Cooper's hawk went into anaphylactic shock and took several hours to recover. Regurgitation has also been reported as a potential side effect, but has not been seen in patients treated by TRC (Tarello 2006).

## SUMMARY

Blood parasite infections appear to be increasing in prevalence in raptor species. In the case of avian malaria, *Plasmodium* organisms are known to cause liver disease, destruction of red blood cells, and death. *Babesia* organisms are also reported to destroy red blood cells but the extent of pathology they can cause is not yet clear. Since raptors can carry these parasites without showing symptoms in the early stage of infection, it is essential to evaluate a blood smear as part of a complete admission exam, and periodically throughout the rehabilitation process. Especially in the case of avian malaria, diagnosing and treating the disease early can increase survivorship of raptor patients. Additional studies need to be conducted on the clinical importance of *Babesia* infections to decide whether treatment is critical.

## LITERATURE CITED

- Merino, S., M. A. Pierce, M. Fernandez, et.al. 2002. Redescription of *Babesia moshkovskii* (Schurenkova) from the griffon vulture *Gyps fulvus* (Hablizl). *Journal of Natural History*. 36:1635-1638.
- Munoz, E., R. Molina, and D. Ferrer. 1999. *Babesia shortti* infection in a common kestrel (*Falco tinnunculus*) in Catalonia (northeastern Spain). *Avian Pathology*. 28:207-209.
- Pierce, M. A. 2000. A taxonomic review of avian piroplasms of the genus *Babesia* Starcovici, 1893 (Apicomplexa: Piroplasmorida: Babesiidae). *Journal of Natural History*. 34: 317-322.
- Pierce, M. A. 2003. Haematozoa. In *Avian Medicine* (J. Samour, ed.). Elsevier Science Limited: Philadelphia, PA. Pp. 245-252.
- Tarello, W. 2006. Effective imidocarb dipropionate therapy for *Babesia shortti* in falcons. *The Veterinary Record*. 158:239-240. 



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