# Avian Hematology

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**KEYWORDS**

• Avian hematology • Erythrocyte • Leukocyte • Anemia • Leukocytosis • Leukopenia

**KEY POINTS**

- Hematology is an invaluable part of the clinical management of avian patients.
- The half-life of avian erythrocytes is shorter than mammalian erythrocytes.
- Acute blood loss is the most common cause of regenerative anemia in birds.
- Nonregenerative anemia is the most common type of anemia described in birds.
- The heterophil is the most common granulocyte found in the peripheral blood of birds.
- Lymphocytes are second to heterophils in frequency in most avian species except Amazon parrots and canaries, in which the lymphocytes may be the predominate leukocytes and may account for up to 70% of circulating leukocytes.

## AVIAN HEMATOLOGY

Hematology is an invaluable part of the clinical management of avian patients. To evaluate the health of their patients, the clinical progression of disease, and response to therapy, avian veterinarians should be well versed in sample collection, cellular identification, and interpretation of results of the hemogram. Avian erythrocytes and leukocytes may be evaluated with automated or manual techniques. Packed cell volume (PCV), total erythrocyte count, hemoglobin concentration, Wintrobe indices, reticulocyte count, erythrocyte morphology, total white blood cell (WBC) count, and leukocyte differentials are all used to evaluate the avian hemogram. It should be noted that although hematologic reference intervals and ranges have been established for many avian species, determined values may vary by age, sex, season/environment, and hormonal influences.[1–4] In one study, PCV and total erythrocyte count tended to be higher in male birds compared with female birds, and also increased with age. In another study,[5] only the erythrocyte count tended to increase significantly with age in bald eagles.

The reader should know that although an understanding of avian hematologic techniques is essential, methods of sample collection, processing, and analysis of blood samples are elaborated in detail elsewhere.[1,6–8]

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## AVIAN ERYTHROCYTE MORPHOLOGY

Avian erythrocytes are oval or elliptical in shape with a central, oval nucleus and are mostly uniform in appearance among avian species (Fig. 1). Comparatively, they are larger than mammalian erythrocytes. When stained with Wright or Romanowsky stains, healthy, mature erythrocytes have an orange-pink–colored cytoplasm. The nucleus, which is uniformly clumped in appearance, stains a dark purple color and becomes more condensed with age.[1,3]

### *Polychromatophilic Erythrocytes and Reticulocytes*

The half-life of avian erythrocytes is relatively short (28–45 days), which results in the regular appearance of polychromatophilic erythrocytes (approximately 1%–5% of the total erythrocyte count) in the circulating blood pool.[9] These polychromatic erythrocytes are more rounded in appearance, their cytoplasm stains more basophilic, and their nuclei are more rounded with less densely packed chromatin when compared with mature erythrocytes. They, along with reticulocytes, are indicative of bone marrow activity and erythrocyte regenerative capacity in avian species.[1,3] Polychromatophilic erythrocytes appear as reticulocytes when stained with Wright or new methylene blue stains. However, a significant number of avian erythrocytes contain basophilic granular material when supravitally stained; therefore, reticulocytes are defined as having a distinct ring of reticular material (characteristic clumps of residual cytoplasmic RNA) partially or completely encircling the nucleus.[3,9,10] Although the percentages of polychromatophils parallel the percentage of reticulocytes, the reticulocyte percentage is a more precise measurement of erythrocyte regeneration.[11] Immature erythrocytes with basophilic staining cytoplasm and a smaller, more rounded appearance than mature red blood cells are most commonly rubricytes.[1,3] They are an indication of a marked regenerative response in avian patients.

### *Anisocytosis*

Variation in size and of avian erythrocytes is occasionally seen in peripheral blood smears.[1] Slight anisocytosis is considered an insignificant finding in birds.[3] Automated methods of performing erythrocyte counts can calculate the degree of anisocytosis using the red cell distribution width (RDW%), which measures variation in red blood cell size, or mean corpuscular volume.[7] RDW% may vary depending on the patient's age or even between laboratories. Normal psittacine RDW% is 10% to 11%. Percentages above those indicate an increase in anisocytosis.[7]

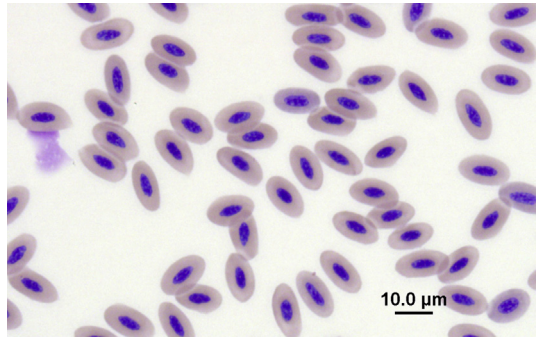


**Fig. 1.** Erythrocytes in the blood film of a hawk (*Buteo jamaicensis*) (Wright-Giemsa stain).