Nucleated RBC

Interpretive Summary

Description: Nucleated red blood cells (metarubricytes) represent the early stages of a red blood cell before it matures. They are produced primarily in the bone marrow and are only occasionally observed in peripheral blood.

Decreased Nucleated RBC

Common Causes

- Normal (reference intervals include zero)

Increased Nucleated RBC

Common Causes

- Regenerative anemia
  - Hemolysis
  - Blood loss
- Splenic disease
- Post-splenectomy

Uncommon Causes

- Bone marrow damage
  - Hypoxia
  - Endotoxemia/septicemia
  - FeLV
  - Drugs
  - Trauma (fractures)
  - Myelophthisis: myelodysplastic syndrome, leukemia, metastatic neoplasia
  - Myelofibrosis, bone marrow necrosis
  - Heat stroke
- Extramedullary hematopoeisis, especially splenic
- Lead poisoning
- Iron or copper deficiency
- Hereditary macrocytosis of Poodles

Related Findings

- Hemolysis
  - Increased reticulocytes
  - Increased leukocytes, +/- decreased platelets
  - Increased serum bilirubin, bilirubinuria, +/- hemoglobinuria
  - Spherocytosis (in dogs), autoagglutination, +/- positive Coombs test (IMHA)
  - Positive serology, PCR, or antigen testing for infectious causes
  - Blood parasites visualized on blood smear
  - Gastrointestinal metallic foreign body found on abdominal radiographs
- Blood loss
  - Increased reticulocytes
  - Decreased total protein and/or albumin
  - Pleural or peritoneal effusion and/or pulmonary hemorrhage on radiographs or ultrasound
  - Positive fecal ova and parasite screen, positive fecal occult blood

    - +/- Decreased serum iron concentration, normal total iron binding capacity, and decreased serum ferritin (if chronic blood loss)
    - Increased PT and/or PTT, decreased platelets, prolonged buccal mucosal bleeding time, or low von Willebrand factor level
- Splenic disease
    - Schistocytes, keratocytes, and acanthocytes
    - Neoplasia or splenitis found on cytology or histopathology
    - Splenomegaly or splenic mass on abdominal imaging

Additional Information

Physiology

- Nucleated red blood cells are nucleated precursors to mature red blood cells found in circulation.
- Presence in peripheral blood may be associated with a regenerative anemia or due to pathologic conditions affecting bone marrow regulation of red blood cell release.

Diagnostic Methodology

- Circulating nucleated red blood cells are counted along with white blood cells as part of the white blood cell count
    - Automated cell counters cannot differentiate nucleated red blood cells from white blood cells
- Manual slide review is used to count the number of nucleated red blood cells per 100 white blood cells to determine a corrected white blood cell count.
- The correction is performed using this equation: Corrected WBC count = (WBC count [obtained by machine] x 100)/ (# NRBC [obtained during 100 cell differential count] + 100)

References

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