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.

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**Decreased Nucleated RBC**

**Common Causes**
- Normal (reference intervals include zero)

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**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 hematopoiesis, 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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