Neutrophils

Interpretive Summary

**Description:** Segmented neutrophils are the most abundant type of white blood cell (WBC). They respond quickly to inflammation and stress, are capable of phagocytosis, and have antimicrobial properties.

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**Decreased Neutrophils**

**Common Causes**

- Decreased bone marrow production
  - Infection
    - Parvovirus in dogs and cats
    - Feline leukemia virus
    - Toxoplasmosis
    - Rickettsial disease
  - Neoplasia
- Increased tissue demand
  - Sepsis
  - Viral infections
  - Sequestration: collection of cells within an organ system or body compartment: abscess, pyometra, peritonitis, pneumonia, necrotic tumor, etc…
- Toxicity
  - Estrogens
  - Chemotherapy
  - Chloramphenicol, sulfas
  - Idiosyncratic drug reactions, toxicities

**Uncommon Causes**

- Decreased bone marrow production
  - Immune-mediated destruction within the bone marrow
  - Bone marrow fibrosis, aplasia, or necrosis
  - Cyclic hematopoiesis: grey collies
  - Idiopathic
- Peripheral destruction by immune or other mechanisms

**Related Findings**

- Decreased bone marrow production
  - Decreases in all three cell lines (red blood cells, white blood cells and platelets) or two of three cell lines may suggest a bone marrow disorder
  - Infection
    - Positive serology or PCR tests for infectious organisms
    - WBC morphologic abnormalities such as toxicity, reactive lymphocytes
  - Neoplasia
    - Nonregenerative anemia, thrombocytopenia, and/or leukopenia
    - Atypical or unclassified cells found on blood smear evaluation
    - Neoplastic cells on bone marrow aspirate cytology or biopsy
- Increased tissue demand
  - Sepsis
    - Toxic neutrophils and/or band neutrophils
    - Increased PT and PTT, decreased platelets and fibrinogen (due to DIC)
    - Positive culture of urine, CSF, joint fluid, blood, tissue, body cavity effusion, other
- Pleural effusion or pneumonia on thoracic radiographs
- Peritoneal effusion, prostatic abscess/prostatitis, pyometra, or necrotic mass on thoracic or abdominal radiographs, or abdominal ultrasound
- Thickened heart valve on echocardiogram
- Septic effusion on fluid analysis and cytology
- Suppurative inflammation +/- bacteria on cytology or histopathology

**Increased Neutrophils**

**Common Causes**

- Inflammatory response (local or systemic; chronic or acute)
  - Infections: bacterial, fungal, protozoal
  - Immune-mediated disease
  - Tissue necrosis
  - Neoplasia
- Corticosteroid-induced: endogenous or exogenous glucocorticoids

**Uncommon Causes**

- Inflammatory response
  - Infections: parasitic, rickettsial, viral
- Chronic or acute neutrophilic leukemia
- Epinephrine-induced physiologic neutrophilia

**Related Findings**

- Inflammatory response
  - Infectious
    - Increased neutrophils, toxic neutrophils and/or band neutrophils
    - Positive culture of urine, CSF, joint fluid, blood, tissue, body cavity effusion, other
    - Evidence of infection on abdominal or thoracic imaging
    - Positive serology or PCR results
    - Septic effusion on fluid analysis and cytology
    - Suppurative inflammation +/- bacteria/fungal organisms on cytology or histopathology
  - Immune-mediated disease
    - Increased neutrophils and monocytes
    - Nonregenerative or regenerative anemia, thrombocytopenia
    - Inflammation found on fluid analysis and cytology of joint fluid, CSF, or body cavity effusion
    - Positive Coombs, ANA titer, or Rheumatoid Factor
  - Tissue necrosis
    - Increased neutrophils and monocytes, toxic neutrophils and/or band neutrophils
    - Necrotic mass on abdominal or thoracic radiographs, or abdominal ultrasound
    - Evidence of necrosis on cytology or histopathology of a mass or organ
  - Neoplasia
    - Enlarged lymph nodes or mass on abdominal radiographs, abdominal ultrasound, or thoracic radiographs
    - Neoplastic cells on cytology or histopathology
- Corticosteroid-induced
  - Neutrophilia, lymphopenia, monocytes, eosinopenia, possible thrombocytosis
  - Increased ALP, possible mild increases in GGT, ALT, cholesterol, and glucose
  - Supportive endocrine testing (abnormal urine cortisol: creatinine ratio, ACTH stimulation test, and/or low dose dexamethasone suppression tests)
Additional Information

Physiology

- Segmented neutrophils are the mature neutrophils that form the largest portion of the WBC count in domestic animals.
- Neutrophils are only in the peripheral blood for approximately ten hours before exiting the vascular system, either from normal cell death or in response to chemotactic factors.
- Neutrophils are quickly activated and increase in number in response to a myriad of stimuli, such as infecting agents (viral, bacterial, fungal, parasitic, etc), foreign substances, tissue damage, necrosis, and cancers.
- Neutrophils exist in two main pools in the peripheral blood: those freely floating in circulation (circulating neutrophil pool or CNP) and those adhered to the endothelium (marginated neutrophil pool or MNP); only the neutrophils in the CNP are measured on a CBC.
- Neutrophils can be recruited from the MNP within minutes (e.g. in response to stress) and will then increase the neutrophil count

Diagnostic Methodology

- The segmented neutrophil percentage (or relative segmented neutrophil count) is the number of segmented neutrophils (typically per 100 to 200 white blood cells) and is reported as a percentage.
- Morphology evaluation may provide valuable clues as to potential cause of neutrophil abnormalities (inflammation, infection, neoplasia, etc…)

References


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