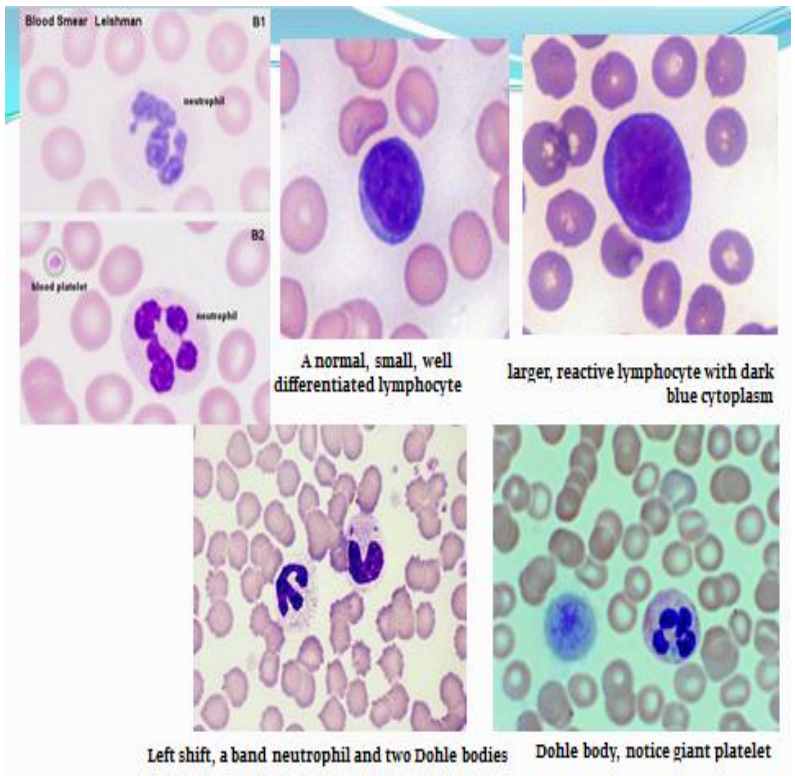
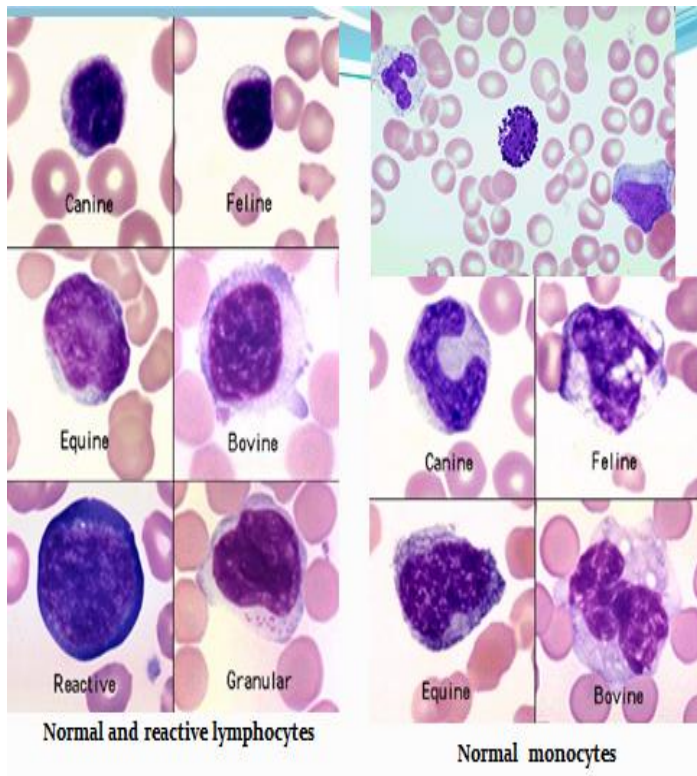
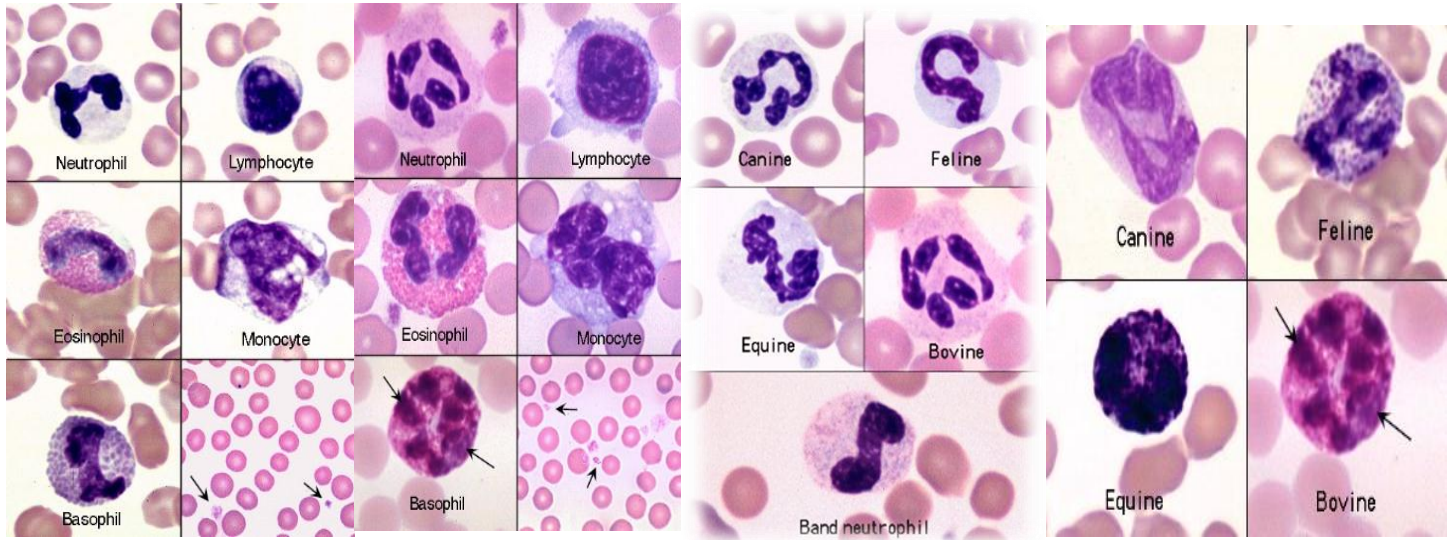


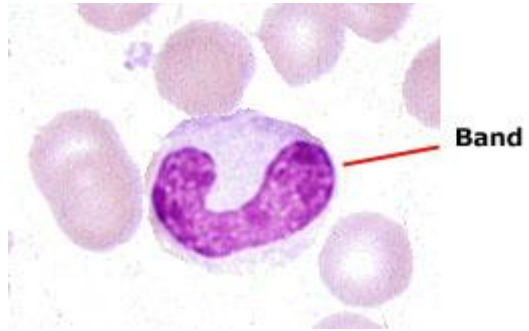
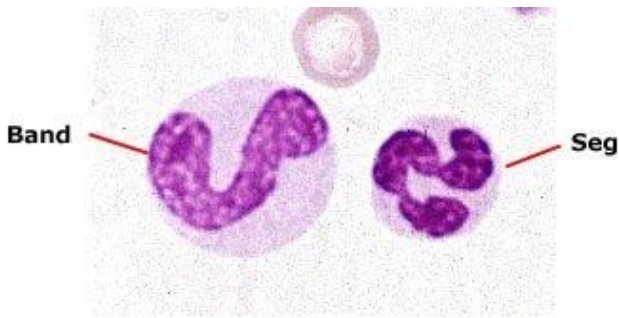
10th. Practical in clinical pathology: Abnormal morphology of White Blood Cells (WBCs).

Clinical Importance of WBC Morphology

Light microscopy is greatest value in confirming the automated white blood cell count and performing a manual differential count. However, specific morphologic abnormalities of leukocytes occur, and can provide evidence of disease processes.

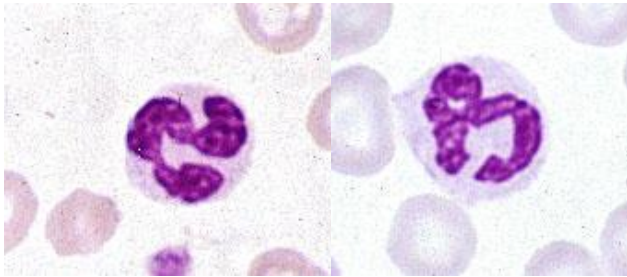
Normal White Blood Cells (WBCs).



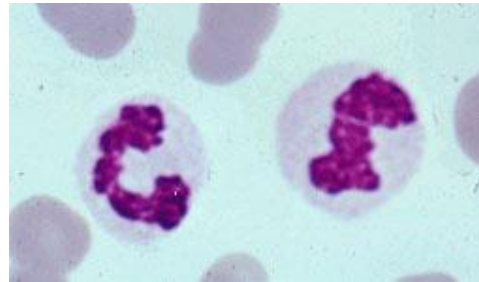


Seg:
 Larger
 Lighter, more dispersed chromatin
 Thicker nucleus
 No constrictions; sides more parallel
 Recognize toxic change in neutrophils

Band:
 Smaller
 Dark, condensed chromatin
 Thin nucleus
 Nuclear constrictions (>50%)



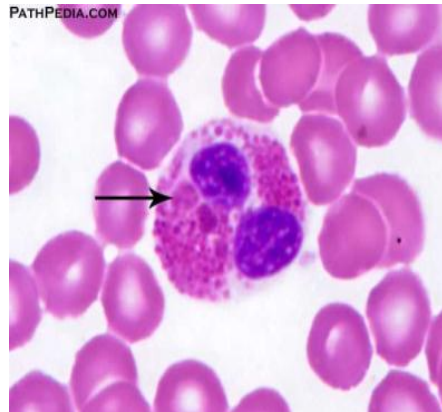
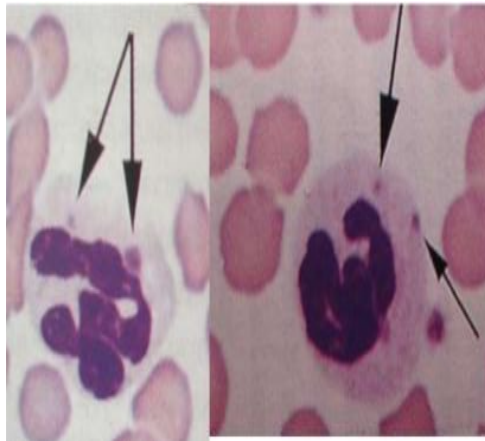
Canine segs



Equine segs appear more knobby with individual constrictions less obvious

Abnormal White Blood Cells (WBCs).

- Chédiak-Higashi granules:** Chédiak-Higashi granules are very large red or blue granules that appear in the cytoplasm of granulocytes, and lymphocytes, or monocytes in patients with the Chédiak--Higashi syndrome.



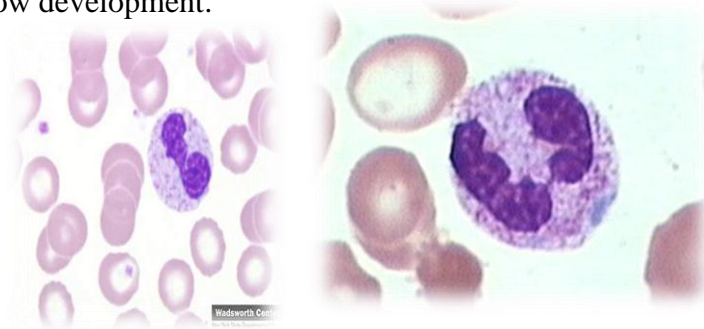
Abnormal morphology of neutrophils:

1-In the cytoplasm Toxic change :

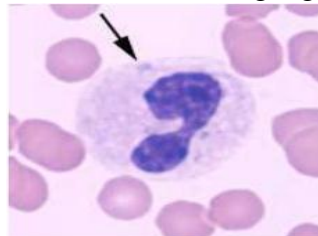
Toxic neutrophils occurs when the maturation in the bone marrow accelerated. Often accompanied by a left shift and causes by inflammation and graded as mild , moderate and sever . Evaluated five main feature to determined toxicity .

Type of toxic changes

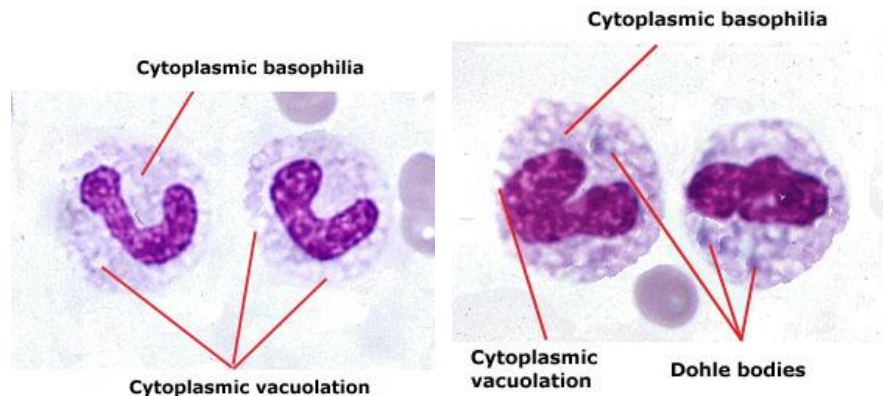
- 1. Cytoplasmic basophilia:** cytoplasm develops a streaky irregular darker blue appearance due to retention of ribosomal structures. Indicating immaturity and hurry in bone marrow development.



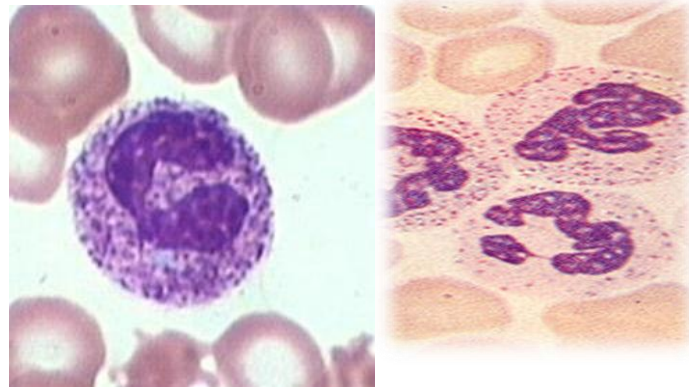
- 2. Presence of Dohle bodies:** Döhle bodies are variably sized (0.1 to 2.0 μm) and shaped, blue or grayish-blue cytoplasmic inclusions usually found near the periphery of the cell. Dohle bodies are lamellar aggregates of rough endoplasmic reticulum, which appear in the neutrophils, bands, and metamyelocytes of patients with infection, burns, uncomplicated pregnancy, toxic states, or during treatment with hematologic growth factors such as G-CSF.



- 3. Cytoplasmic vacuolation:** Vacuoles are present within the cytoplasm of the cell giving it a frothy appearance (Vacuolation can also be a storage related artifact)

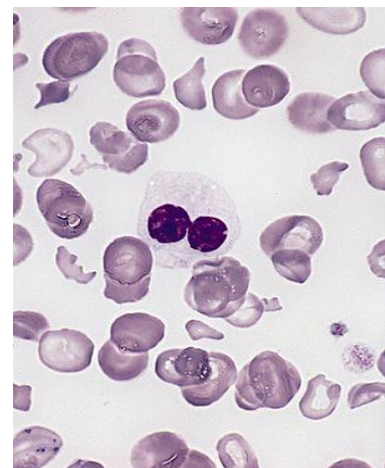


4. **Nuclear immaturity:** Nuclear chromatin finer , lighter and less clumped than normal cells.
 5. **Toxic granulation :** Distinct fine granule in the cytoplasm. Presence of very few – many dark purple cytoplasmic granules, it represent primary azurophilic granules that retain their staining ability suggesting severe toxemia in horses, cattle, and sheep. Toxic granulation is usually accompanied by a "shift to the left" in the neutrophilic population, and by the presence of vacuolations in the cytoplasm (toxic vacuolations) and Dohle bodies.
- A. **Toxic hypergranulation** is small dark blue to purple granules resembling primary granules appear in the cytoplasm of metamyelocytes, bands, and segmented neutrophils during inflammatory states, burns, and trauma, and upon exposure to hematopoietic growth factors such as granulocyte-colony stimulating factor (G-CSF).



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- B. **Hypogranulation, or degranulation,** is characterized by a decrease in number or complete absence of specific (primary) granules. This means either an infection is present, or the possibility of myelodysplastic syndrome.

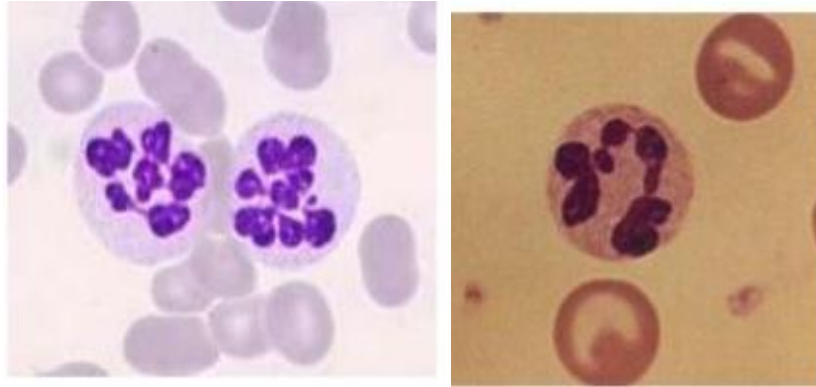


2. In lobulation of nucleus

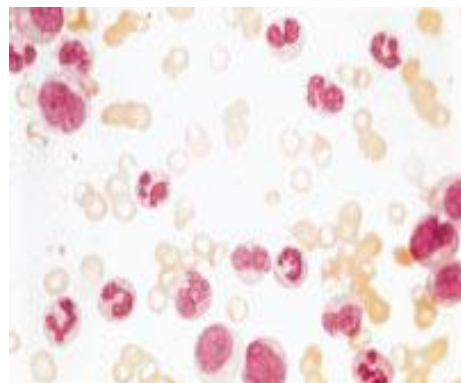
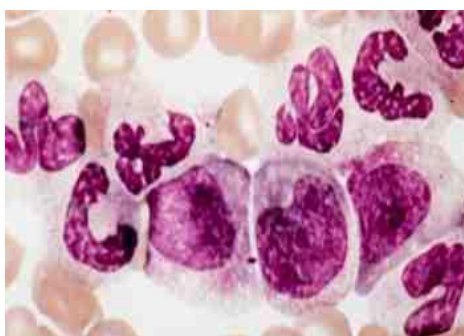
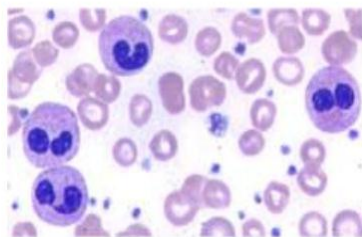
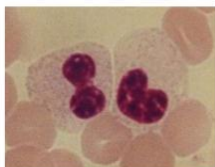
- A. **Neutrophilic hypersegmentation (Right shift).** Increased lobulation of granulocyte nuclei (Neutrophil with five or more lobes)

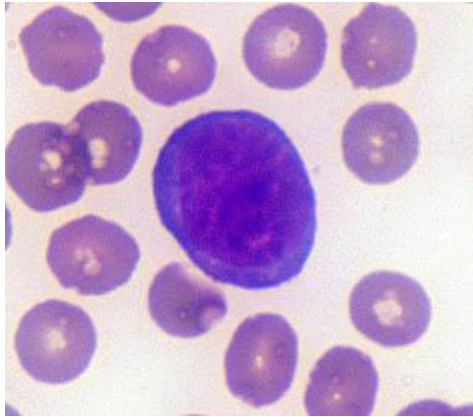
Causes:

- Common ageing artifact
- Exposure to excessive amount of EDTA is a
- Characteristic finding in megaloblastic anemia
- an inherited autosomal dominant trait (hereditary hypersegmentation of neutrophils).
- **Glucocorticoid therapy, hyperadrenocorticism and chronic infection**

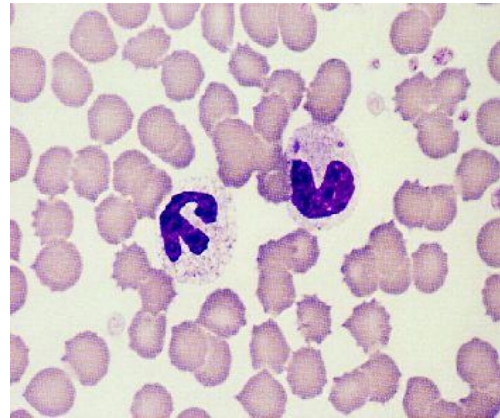


B. Neutrophilic hyposegmentation(left shift) Single or bi-lobed neutrophils (Pelger-Huët cells) can be inherited (Pelger-Huët anomaly), or acquired (pseudo-Pelger-Huët cells) in patients with malignant myeloproliferative disorders (including preleukemia and myelodysplastic syndromes) and infections or tumors which have metastasized to the bone marrow.

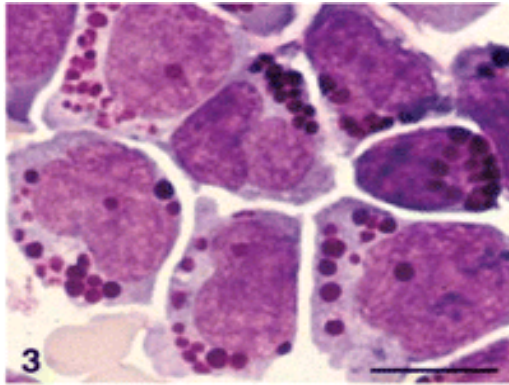
Pelger-huet anomaly



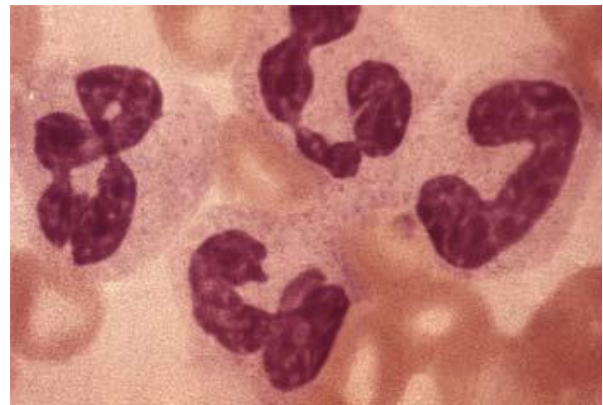
larger, reactive lymphocyte with dark blue cytoplasm



Left shift, a band neutrophil and two Dohle bodies



Leukocytosis caused by granular lymphocyte leukemia



Leukocytosis with band neutrophil , Dohle body and mild toxic granulation