Objectives

To outline the characteristics of the white blood cells.
To define and distinguish leucocytosis and leucopenia.
To review disorders that affect WBC's.
To address the difference between:
- agglutinogen
- agglutinin
- agglutination
To understand the complications of Rh during pregnancy.
To outline the steps and role of blood in the inflammatory response process.

Leukocytes
White Blood Cells

I. Physical characteristics
II. Composition
  Less than 1% of the total blood volume.
  Average ct is 4800 – 10,800 WBCs /cc
III. Origin and Fate

Types of WBC’s

I. Neutrophils – bacterial infections
II. Eosinophils – parasites & allergies
III. Basophils – histamines & inflammation
IV. Lymphocytes – produce antibodies
V. Monocytes - phagocytic

Abnormal WBC Counts

**Leukocytosis** – a WBC ct of over 11,000 cells/cc. Normal response to infection in the body.

**Leukopenia** – WBC ct below 4,000.
May occur because of drugs such as anticancer agents such as radiation.

Leukopoiesis

Hormonally stimulated.
Glycoproteins released by the macrophages and T lymphocytes.
- Interleukins
- Colony-stimulating factors
* WBC’s start out from a precursor cell called the Hemocytoblast
Leukocyte Disorders

Leukemia – cancerous proliferation. Immature WBC’s – often die of infection.

Mononucleosis – viral infection. Elevated monocytes and lymphocytes.

Bacterial infections – higher neutrophils.

Chronic lymphocytic leukemia (CLL). Peripheral blood smear showing large numbers of diseased B lymphocytes.

Mononucleosis

Atypical lymphocyte seen in patient with infectious mononucleosis. The cell on the left is a typical small lymphocyte with its nucleus almost filling the cell. The larger atypical lymphocyte on the right has much more cytoplasm and a larger nucleus.

Other Infections

Trypanosoma – African Sleeping Sickness

Septicemia

Malaria

Blood Groups

- PM Glycoproteins (antigens) on the external surface of RBC’s.
- 30+ varieties of RBC antigens.
- Blood typing done before a transfusion to prevent rejection.
- ABO blood groups (1 antigen family set).
- Based on the presence or absence of 2 agglutinogens
  - Type A
  - Type B
- Can result in the phenotypes: A, B, AB or O.
  - Type O is the most common.
  - AB is the least prevalent.
Making sense of the “a” words

**Antigen**  any agent that causes an immune response.

**Agglutination**: clumping of foreign cells induced by antigen/antibody complexes.

**Agglutinogen**: RBC antigens that promote agglutination.

**Agglutinin**: preformed antibodies that act against RBC antigens that are not “self.”

Examples:
Those with group A blood have “anti-B” antibodies.
Those with group B blood have “anti-A” antibodies.
Those with AB blood have neither antibody.

Rh factor

Surface antigens on RBC’s.
Antigen present in Rh+ individuals.

**Erythroblastosis fetalis** – reaction that can occur when an Rh- mother carries an Rh+ baby.

**Rhogam** will be administered if the mother is Rh- and the baby is Rh+ immediately after birth to prevent the build up of antibody/agglutinin formation.

.........i.e. It is a booster that removes fetal RBC’s from mother’s circulation.

Healing & Repair

**Role of Platelets**
Thrombopoietin
Form from large megakaryocytes

**Hemostasis** – blood stoppage via clotting mechanism
1) Vessel constriction
2) Platelet aggregation/sealing wound
3) Coagulation
4) Fibrinolysis

Steps of Hemostasis

1) Vascular spasm
   - Smooth muscle contracts, causing vasoconstriction.
2) Platelet plug formation
   - Collagen fibers exposed, platelets adhere
3) Coagulation
   - Fibrin forms a mesh that traps red blood cells and platelets, forming the clot

Disorders related to blood clotting

**Thrombus**
**Embolism**
**Thromboembolitic disease**
**Thrombocytopenia**
**Hemophilia**
Inability to clot blood

May occur because of:
1) Cancer of the bone marrow.
2) Exposure to radiation
3) Liver disease
4) Vitamin K deficiency