Introduction

- **7-8% body weight in mammals**
- ***Consists of***:

+ **Plasma**:
- 45-65% of blood volume
- Alkaline
- Contain dissolved gases, electrolytes, proteins, CHOs, lipids, hormones.

+ **Formed elements**:
- Erythrocytes
- Leukocytes
- Thrombocytes

Erythrocytes

- **Highly specialised**
Contains hemoglobin
-->Carries O2 and Co2
Maintains cell shape
- **Round, biconcave, enucleate (in mammals), 4 -8 Um**
-** Acidophilic cytoplasm: 60% water, 40% Hb
- **Plastic-like, can conform to capillaries**
- **Most abundant, 120-days life span**
- **Mammals**: anucleate
- **Other animals**: nucleate
- In bloodstream as immature form 1st: **Reticulocyte**
+ Slightly larger
+ Methylene blue staining
+ Proportion is clinically important

Leukocytes

- **Responsible for body's immune response**
- **Migrate to other tissues**:
+ Variable cell number
+ Clinical importance: infection, inflammation
- ***Classified into 2 groups***:

+ *Granular leukocytes*:
- Basophils (blue)
- Neutrophils (white)
- Eosinophils (red)

+ *Non-granular leukocytes*:
- Lymphocytes
- Monocytes

Neutrophils

- **Most numerous granulocytes**
Most abundant types of leukocyte in carnivores
- **Large: 10 -12 Um**
- **Lightly stained granules (hardly visible, white)**
- **Nucleus**:
- Mature: multilobed
- Immature: "U" or "S" shape
- Proportion of immature to mature cells is clinically important
- **Barr body in female = inactive X chromosome**

FUNCTION:

- **Phagocytosis of external microorganisms and particles**: enzymes contained with granules inside degrade them
- **Go in large number to deal with infection**; *Main constituent of pus*
- **5-day life span in circulation**

Eosinophils

Characteristics

- **Relatively infrequent** (2-8% of leukocytes)
- **10 - 15 Um**
- **Large, acidophilic granules** (stained red)
- **Bilobed nucleus**
- **Granules contain hydrolytic enzymes and perioxidases**

FUNCTION

- **Phagocytose antigen/antibody complexes** --> Kill helminth parasites: rest against their body, release contents of granules onto them
- **Implicated in hypersensitivity reactions**
Ex: a blood smear from an animal with flea allergy dermatitis will show eosinophilia

Basophils

CHARACTERISTICS

- **Rarely encountered** (1,5% of leukocytes)
- **10 -15 Um**
- **Precursor for tissues' mast cells**
- **Large, darkly basophilic granules (blue)**
- **Granules mostly contain histamine, heparin and serotonin**
- **Bilobed nucleus obscured by granules**

FUNCTIONS

- **Also involved in response to helminth parasites**
- **Play a role in activation of a subset of T cells (T lymphocytes)**
- **Implicated in hypersensitivity reactions (asthma, hayfever, anaphalytic shock)**

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Lymphocytes

CHARACTERISTICS

- **Found in blood and lymph**
- **Concentrated in lymphoid tissue**
--> Lymph nodes, nodules, spleen, Peyer's patches in intestine
- **Second most abundant types of leukocytes**
- **Ovoid to kidney-shaped nucleus that is almost proportionally large as cytoplasm**
- **2 forms:**
- Small: 6-9 Um
- Large: 12-15 Um

FUNCTIONS

- **Frontline for immunological defense system**
-Based on functional grounds, **3 classes**:
+ **T Cells**: responsible for **cell - mediated immune response** --> release granules that kill virus-infected and tumour cells; Small lymphocytes
+ **B Cells: produce antibodies** (humoural immune response)
*Subset of B cells are **Plasma cells**; Small lymphocytes
+ **Natural killer**: also do **cell-mediated immune response**
--> release granules that kill virus-infected and tumor cells; Large lymphocytes

Monocytes

CHARACTERISTICS

- **5% of leukocytes**
- **Largest: 15 - 20 Um**
- **Large, eccentric nucleus: pale -staining**
- **Nuclear shape is variable**:
- Immature: indented
- Mature: horseshoe-like
- **May have 2 or more nucleoli**

Monocytes (cont)

FUNCTIONS

- **Have little function in circulating blood**
- **Highly motile and phagocytic**
- **Leave blood after 3 days**
--> **Macrophage** (free roaming in tissues)
--> **Histiocytes** (fixed in tissues)
- **Respond to:** necrotic tissue, microorganisms, inflammination
- **Also in pus with neutrophils**
- **Multinucleate giant cells form by fusion of macrophages** (reminiscent of osteoclasts)

Thrombocytes

- **Also called Platelets**
- **Involved in formation of blood clots**
- **Cytoplasmic fragments of megakaryocyte**
- **2 -4 Um**
- **Often appear in clumps on blood smear**

FUNCTIONS

- **Respond to damaged endothelium in 2 stages:**
+ Stage 1: aggregate to form an immediate plug --> stop hemorrhage
+Stage 2: catalyse formation of fibrin clot --> forms a more permanent seal

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