

### Introduction

- 7-8% body weight in mammals

- *Consists of:*

+ <b>Plasma:</b>	+ <b>Formed elements:</b>
- 45-65% of blood volume	- Erythrocytes
- Alkaline	-
- Contain dissolved gases, electrolytes, proteins, CHO's, lipids, hormones.	- 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:**

+ <i>Granular leukocytes:</i>	+ <i>Non-granular leukocytes:</i>
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- Basophils (blue) - Lymphocytes

- Neutrophils (white) - Monocytes

- Eosinophils (red)

### 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 peroxidases**

#### 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, inflammation
- 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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