Physiology 12

Blood Contents and Immune Function

Germans Ch 22

Blood contents

- Erythrocytes = red blood cells
  - Purpose, to carry hemoglobin
- Leukocytes = white blood cells
  - Purpose, immune system defense
- Platelets = cell fragments
  - Purpose, clotting factors
Blood contents

- Erythrocytes = red blood cells
  - Purpose, to carry hemoglobin

Blood cells

<table>
<thead>
<tr>
<th>Erythrocytes</th>
<th>Leukocytes</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red blood cells</td>
<td>Neutrophils</td>
<td>Neutrophils</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>Monocytes</td>
<td>Monocytes</td>
</tr>
<tr>
<td>Basophils</td>
<td>Lymphocytes</td>
<td>Lymphocytes</td>
</tr>
</tbody>
</table>

Production of blood cells

- Lymphoid stem cell
- Erythrocyte
- Neutrophil
- Eosinophil
- Basophil
- Monocyte
- Lymphocyte
- Megakaryocyte
- Platelet
e
Negatococyte
Regulation of blood cells is done by hormonal factors that influence stem cell development.

**Erythropoietin**

Decreased oxygen delivery

1. Erythropoietin secretion
2. Plasma erythropoietin
3. Bone marrow
4. Production of erythrocytes
5. Blood pH increase
6. Blood O₂ carrying capacity
7. Restoration of O₂ delivery

**Hemostasis**

Prevention of blood loss
How to prevent blood loss

- Constrict broken vessels
- Clot blood around sites of injury
- Broken endothelial cells expose collagen
  - Circulating Von Willebrand Factor binds collagen
  - Collagen binding alters VWF shape to bind platelets
  - Platelets aggregate around broken area

The Blood clotting reaction
Stopping blood clotting (anticoagulants)

- Natural
- Thrombomodulin = enzymatic inhibition from intact endothelial cells
Stopping blood clotting (anticoagulants)

- Natural
  - Thrombomodulin = enzymatic inhibition from intact endothelial cells
  - Antithrombin III = circulating factor that inhibits clotting factors when bound to heparin

- Drugs
  - Aspirin = Eicosanoid pathways and therefore inhibits thromboxane A2
  - Oral anticoagulants (cumadin etc)
Immune function

The body’s cellular defense

Nonspecific Immune Responses

- Physical barriers
  - Skin
  - Mucus
  - Coughing and Sneezing
Nonspecific Immune Responses

- Physical barriers
  - Skin
  - Mucus
  - Coughing and Sneezing
- Inflammation-Chemotaxis-Phagocytosis

Macrophage

Phagocytosis/intracellular destruction
Nonspecific Immune Responses

- Physical barriers
  - Skin
  - Mucus
  - Coughing and Sneezing

- Inflammation-Chemotaxis-Phagocytosis
- Complement system
Nonspecific Immune Responses

- Physical barriers
  - Skin
  - Mucus
  - Coughing and Sneezing

- Inflammation-Chemotaxis-Phagocytosis
- Complement system
- Interferon Production

Viruses

Role of interferon

(a) Virus
(b) Interferon
(c) Interferon receptor
(d) Antiviral protein

No replication
Specific immune Defenses

- Antigen recognition by antibodies

Immunoglobulin structure

- Specific antigen-binding sites
- One "prong"
- Light chain
- Heavy chain
- Fc ("stem")

Cellular immunity
How do B cells know what antibodies to produce?
Where does all this exchange take place?

- Lymph
- Spleen
- Blood
- Infected tissue
What’s the end result of a specific immune response?