Blood

- Elements: red blood cells (r.b.c), white blood cells, hemoglobin, antigens, etc.
- Serum or plasma portion

Functions of Blood

- Transport of oxygen and carbon dioxide
- Transport of food molecules (e.g., glucose, lipids, a.a.)
- Transport of ions
- Eliminates wastes (e.g., urea)
- Transports hormones
- Regulates heat
- Defends against disease

Blood Components

- Red blood cells (erythrocytes)
- Platelets (thrombocytes)
- 5 kinds of white blood cells (leukocytes)
**Red Blood Cells**
- Erythrocytes
- 40-50% total blood volume
- Transport oxygen, carbon dioxide
- Hemoglobin molecule constitutes 95% of r.b.c.

**White Blood Cells**
- Leukocytes
- Defense against infection

**Plasma**
- Relatively clear liquid portion of blood
- Contains salts, sugars, lipids, amino acids, hormones, proteins, antibodies, metal ions, fibrogens, etc.
Platelets

- Thrombocytes
- Blood clotting
- Calcium
- Vitamin K
- Fibrinogen

Blood Types

- ABO
- Rh
- MN
- Etc.

Agglutination: Antigens

Normal blood

Agglutinating blood antigens
Antibodies - Antigens

ABO Blood Type [Reaction with Antibodies]

<table>
<thead>
<tr>
<th>Anti-A</th>
<th>Anti-B</th>
<th>Blood Type</th>
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</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>B</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>AB</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>O</td>
</tr>
</tbody>
</table>

+ = reaction  - = no reaction

ABO Summary

<table>
<thead>
<tr>
<th>Allele</th>
<th>Genotype</th>
<th>Phenotype</th>
<th>Antigen on r.b.c.</th>
<th>Antibody in serum</th>
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</thead>
<tbody>
<tr>
<td>A, B, O</td>
<td>AA, AO</td>
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<td>A</td>
<td>Anti-B</td>
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<tr>
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<td>B</td>
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<tr>
<td></td>
<td>OO</td>
<td>O</td>
<td>none</td>
<td>Anti-A, Anti-B</td>
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</table>
Rh Blood Type

- Karl Landsteiner & Alexander Wiener (1940)
- Rhesus monkey (Rh)
- DD, Dd = Rh +
- dd = Rh -

<table>
<thead>
<tr>
<th>Anti-Rh</th>
<th>Phenotype</th>
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<td>Rh +</td>
</tr>
<tr>
<td>-</td>
<td>Rh -</td>
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</table>

Rh-Incompatibility

- Mother-fetus incompatibility when Mother is Rh – and fetus is Rh+

<table>
<thead>
<tr>
<th>Father</th>
<th>Mother</th>
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<tbody>
<tr>
<td>D</td>
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<td>Dd</td>
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<tr>
<td>Dd</td>
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</tbody>
</table>

100% Rh- children
90% Rh+ children