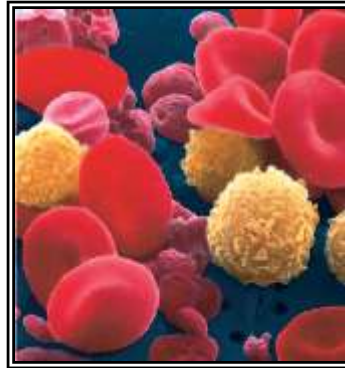


Blood Typing



A, B, AB and O Blood Types

Blood Grouping

- **Transfusion** is the transfer of blood or blood components from one individual to another.
- **Infusion** is the introduction of fluid other than blood, for example: **saline** solution or **glucose** solution.
- **Blood Group** is determined by the **antigens** (agglutinogens) on the surface of RBCs.
- **Antibodies** (agglutinins) can bind to RBC antigens, resulting in **agglutination** (clumping) or **hemolysis** (rupture) of RBCs
- **Blood Groups**: ABO and Rh

ABO Blood Typing





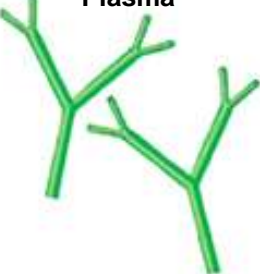


Blood Type	Antigens (Agglutinogens) on Red Blood Cells	Antibodies (Agglutinins) in Plasma
A	A	Anti-B
B	B	Anti-A
AB	A & B	None
O	Neither	Anti-A & Anti-B

<http://learn.genetics.utah.edu/content/begin/traits/blood/>

Distribution of ABO Blood Types

Blood Type	% of U. S. Caucasian	% of U. S. African American
A	41	27
B	9	20
AB	3	7
O	47	46

ABO Blood Groups

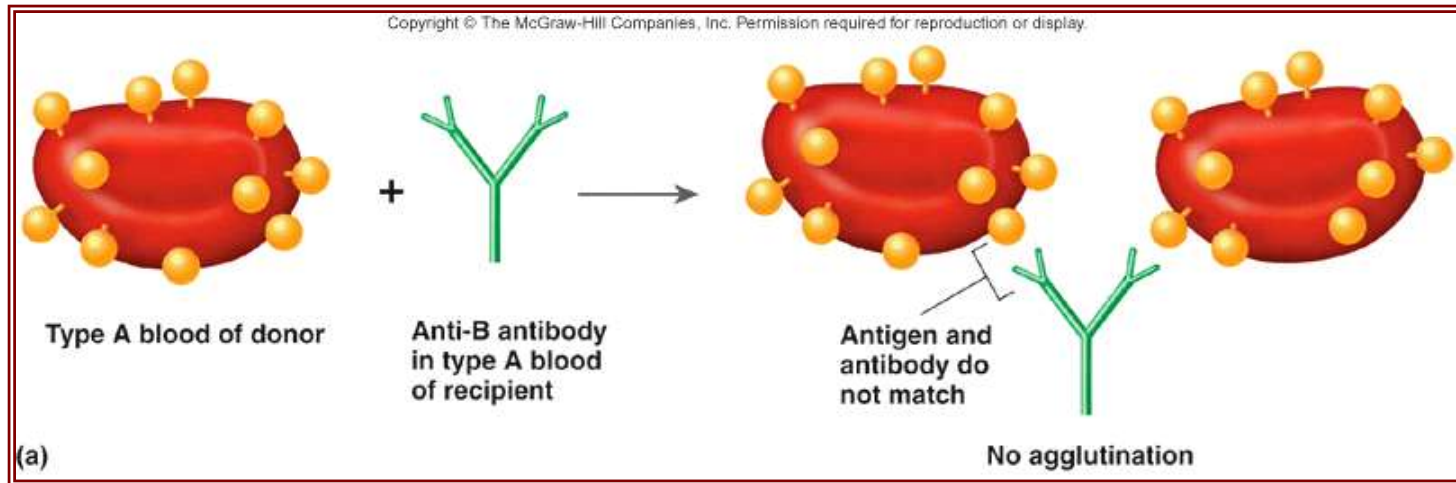
<p>Antigen A</p> 	<p>Antigen B</p> 	<p>Antigens A and B</p> 	<p>Neither antigen A nor B</p> 
<p>Anti-B antibody Plasma</p> 	<p>Anti-A antibody Plasma</p> 	<p>Neither Anti-A nor Anti-B antibodies Plasma</p>	<p>Anti-A and Anti-B antibodies Plasma</p> 

Blood Transfusion

Blood Group	Prevalence	Blood Rec.
O	****	Only O
A	***	O or A
B	**	O or B
AB	*	All

- If the wrong blood type is used, the person's own immune system immediately attacks the donor's blood and causes clots and RBC destruction that can lead to total kidney failure and death.

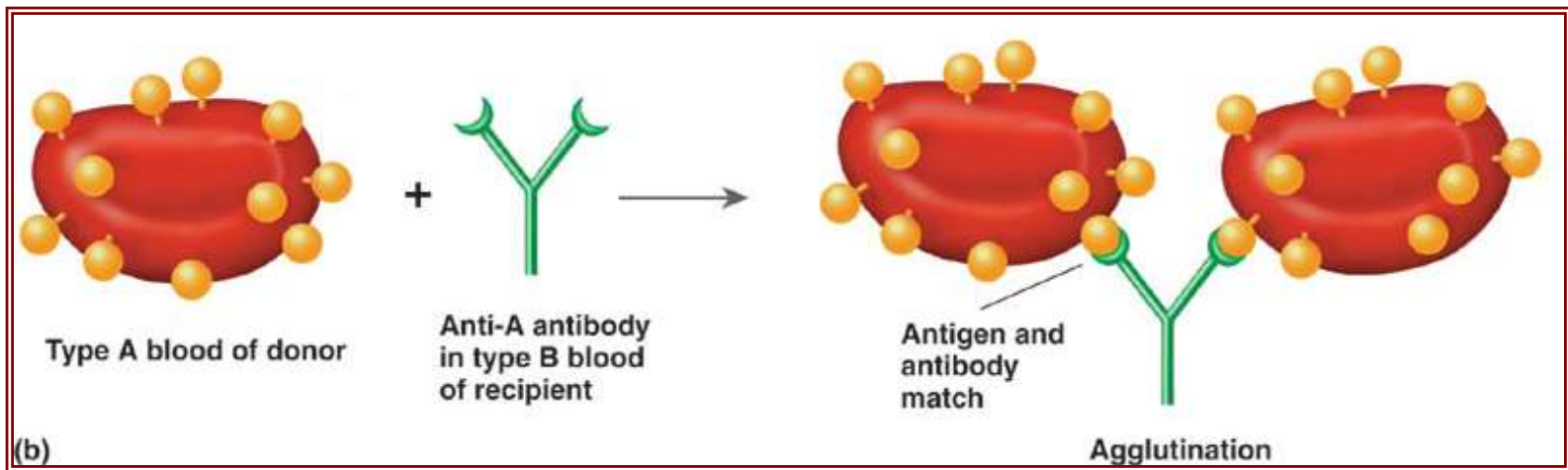
No Agglutination Reaction



- A person with blood type **A** can receive blood from a donor with blood type **A**.
 - The *anti-B* antibodies in the recipient **do not** combine with the type **A** antigens on the red blood cells of the donor.

Agglutination Reaction

- A person with blood type *B* cannot receive blood from a donor with blood type *A*.
 - The *anti-A* antibodies in the recipient **will** combine with the type *B* antigens on the red blood cells of the donor.



Blood Replacement

- If severe blood loss occurs (>30%), the situation is life threatening and requires that the lost blood be replaced.
- The infusion of blood requires that the person's blood type be known.

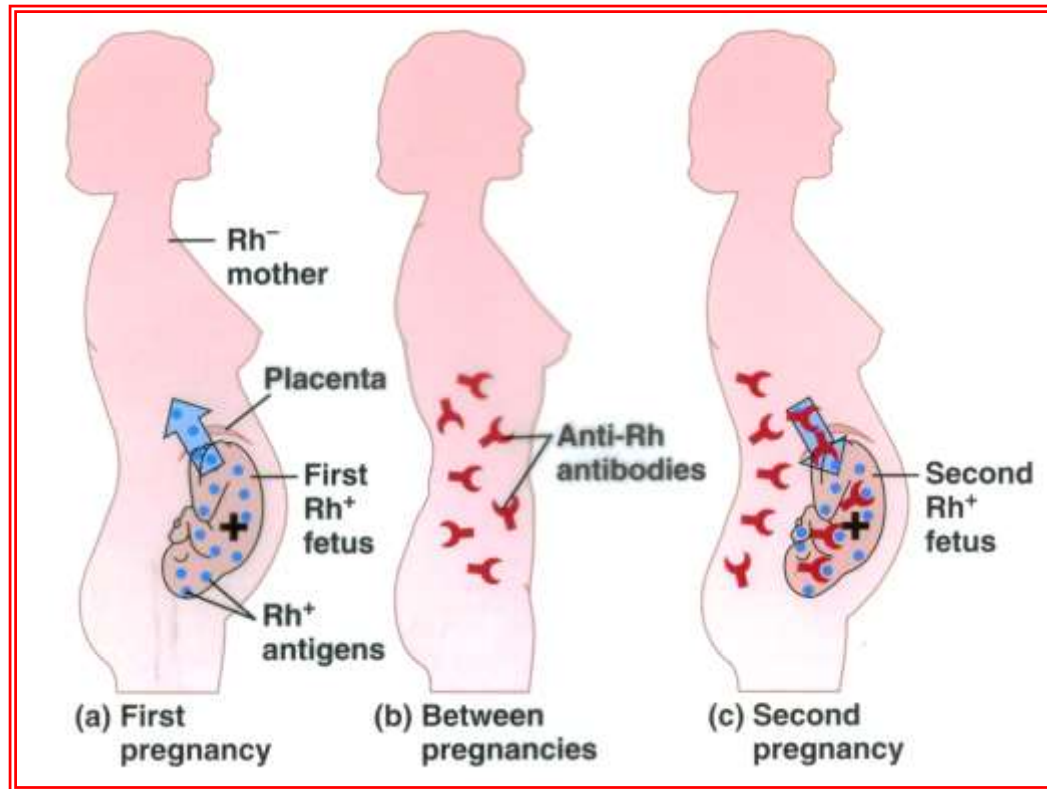
Plasma and Blood Expanders

- In order to avoid blood reactions when blood loss is substantial and there is no appropriate blood for transfusion, either plasma or artificial materials can be used to replace volume.
- As long as the expanders have no RBC's, there should be no transfusion reaction.
 - 0.9% saline
 - Human serum albumin
 - Altered physiological saline.

Development of the Fetus

- In the early developing fetus, the **yolk sac**, the **liver** and the **spleen** are forming blood cells.
- By the seventh month of gestation and into adulthood, only the **red bone marrow** makes blood cells unless something happens. Liver and spleen can form blood cells in adults.
- The fetus makes a different hemoglobin from the adult. This form is called **hemoglobin F** and it has a higher affinity for oxygen than does the adult form.

Hemolytic Disease of the Newborn (HDN)



HDN is the most common problem with *Rh* incompatibility.

Development of HDN of the Newborn

- A small quantity of fetal blood leaks across the placenta into the maternal blood stream.
- If the mother is Rh^- and the baby is Rh^+ , the mother's immune system begins to produce *anti-Rh antibodies*.
- The mother's antibodies cross the placenta during the subsequent pregnancy into the fetal blood.
- If the second fetus is Rh^+ , the antigen-antibody reaction causes hemolysis of fetal RBCs and it results in HDN.

Treatment of HDN

- If a woman has Rh^- and gives birth to a child, or if she has a miscarriage or abortion, she is given an injection of *anti-Rh antibodies* called *anti-Rh gamma globulin* or **RhoGAM** to prevent HDN.
- The antibodies bind to the fetal *Rh antigens* and inactivates them if they crossed the placenta during birth, and the mother's immune system does not respond by producing antibodies.

Rh Factor

- Individual with *Rh*⁺ if
 - *Rh*⁺ and *Rh*⁺
 - *Rh*⁺ and *Rh*⁻ (*Rh*⁺ is dominant over *Rh*⁻)
- *Anti-Rh* antibodies of the system are not normally present in the plasma, but can be produced if an individual with *Rh*⁻ is exposed to *Rh*⁺