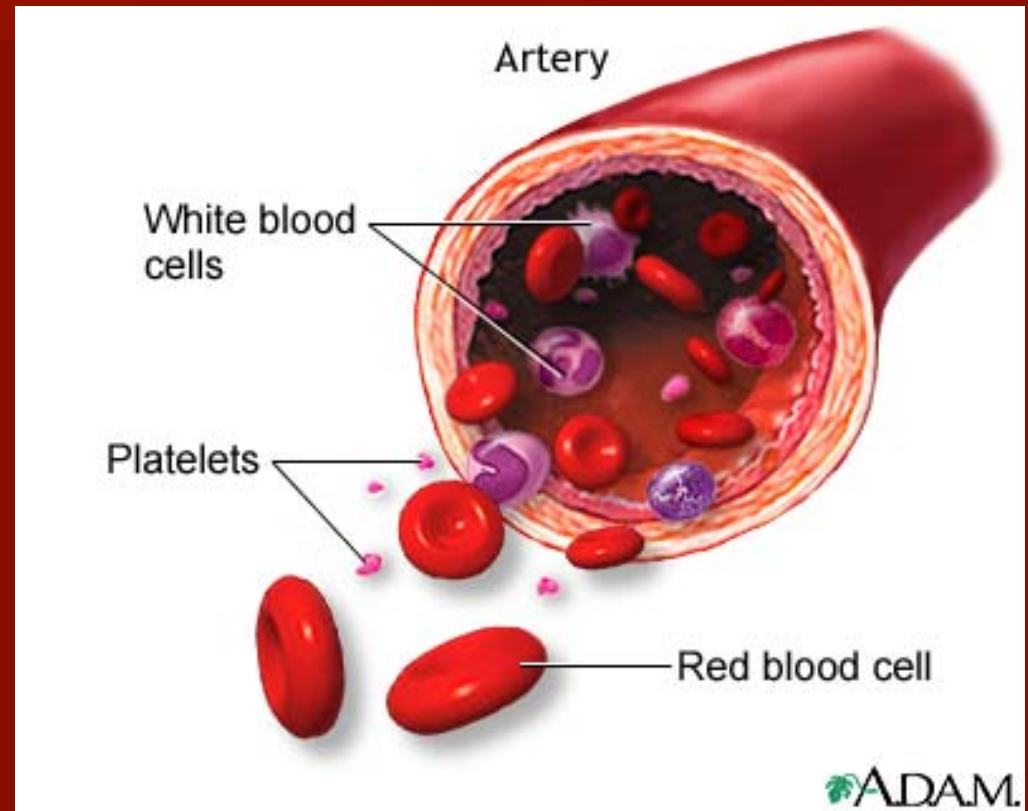


Ch. 14 Blood

*Transportation, Regulation &
Protection*

Function: transports...

- Oxygen
- Carbon dioxide
- Nutrients
- Waste products
- Hormones
- Enzymes



Functions *(maintenance of homeostasis)*

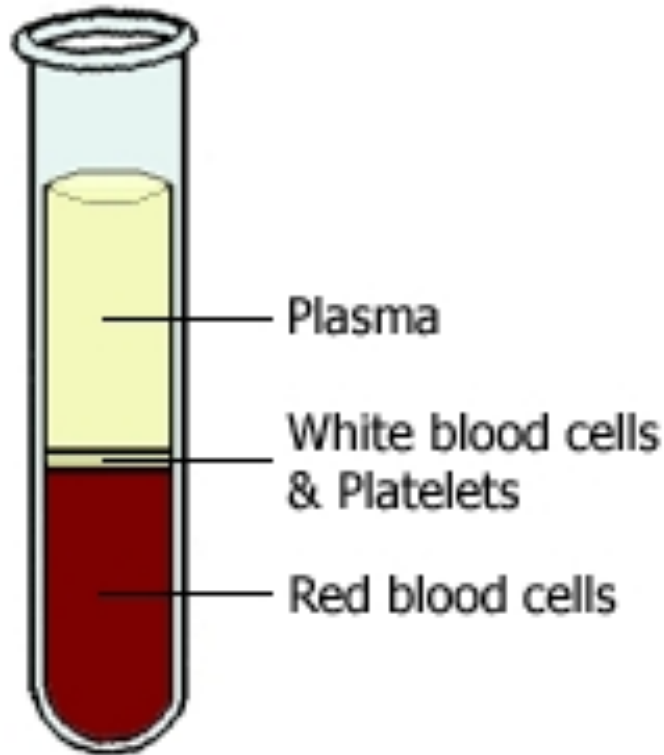
Regulates...

- pH (buffers)
- Body temperature
- Water content

Protects against...

- Blood loss (hemostasis)
- Foreign microbes (white blood cells)
 - Infection
 - Injury
 - Immune response

Connective tissue- 5 Liters!



- Plasma

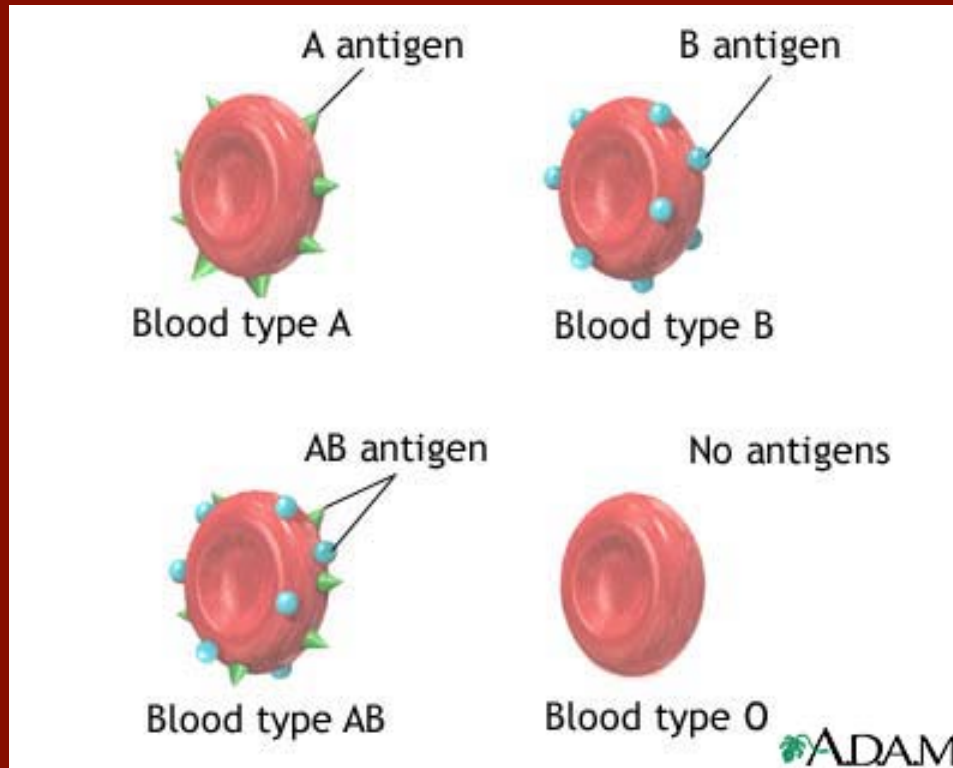
- Hemocrit
 - Erythrocytes
 - Thrombocytes
 - Leukocytes

Hematopoiesis

- Erythrocyte production
- Red bone marrow
- Regulation- erythropoietin (hormone)
 - Negative feedback
- Dietary factors
 - Vitamin B₁₂ & folic acid
 - Iron

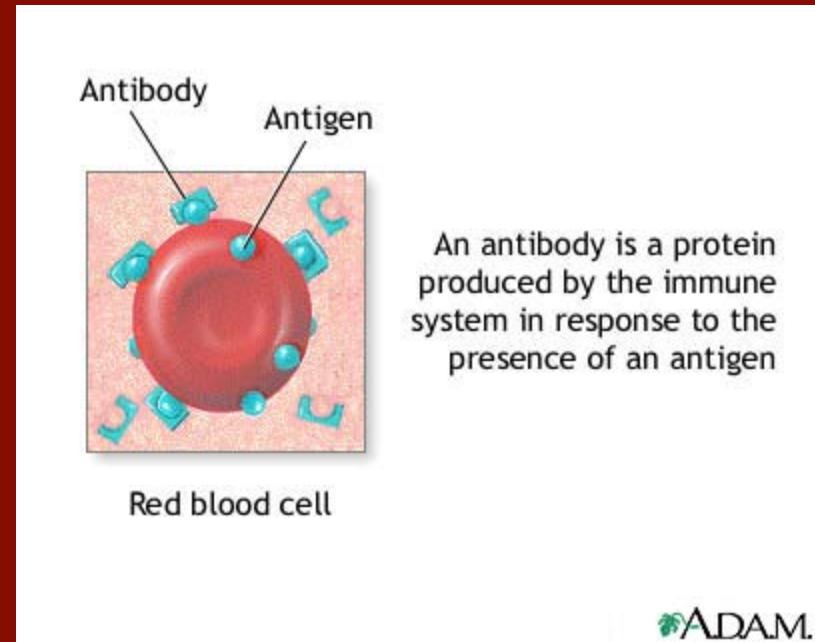
ABO Blood Types

- Based on presence/absence of A & B antigens (agglutinogens)

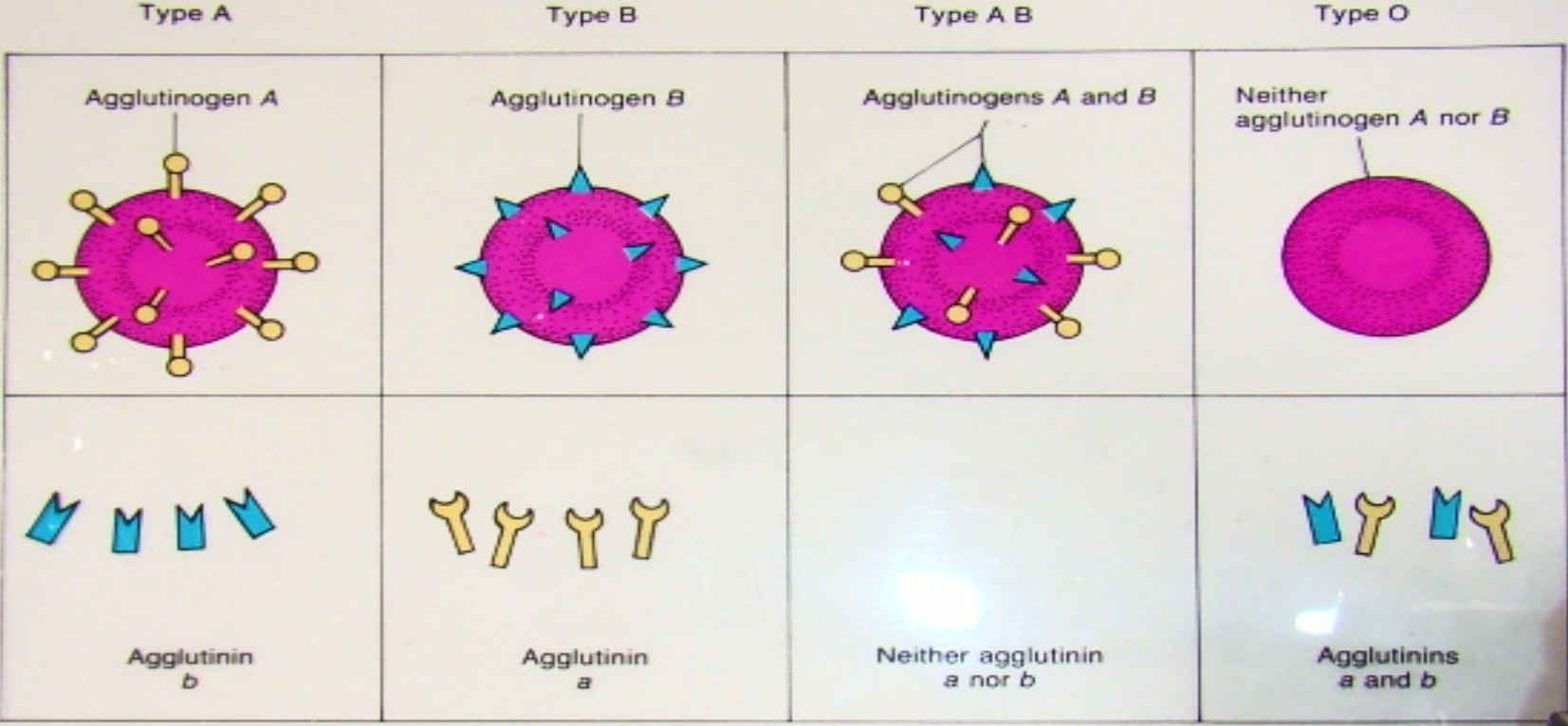


Blood Types

- Antigen = a substance the body recognizes as foreign
 - “flag” on surface of red blood cell
 - **Agglutinogen** on cell
- Antibody = binds to antigen to clump it up
 - “Y” proteins in blood plasma
 - **Agglutinin** in plasma



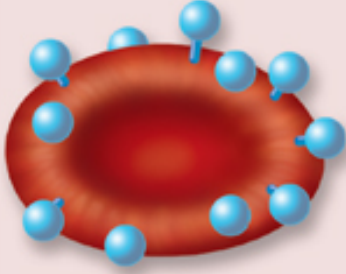
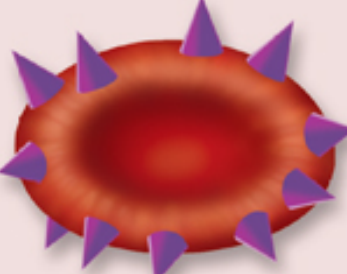
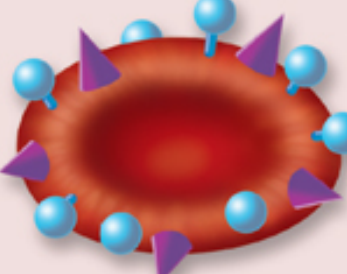




In the case of blood, agglutinins spontaneously form in the first few months of your life.



AGGLUTINATION REACTION

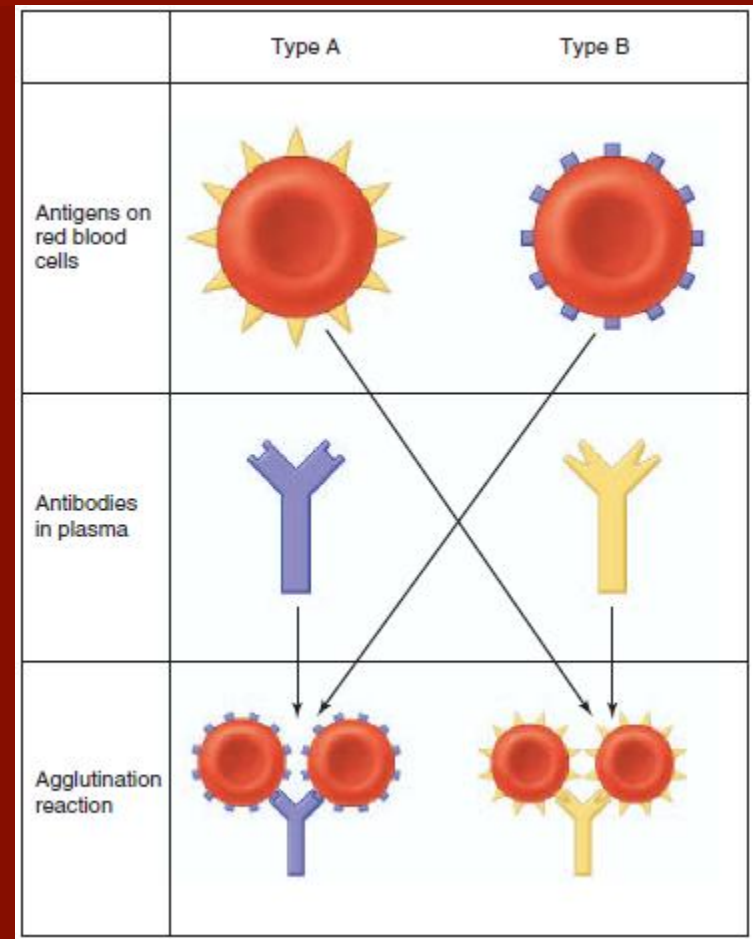
- CONCERN for blood transfusion
- Clumping caused by reaction between antibodies (in plasma) and antigens (on red blood cell membranes)
- *Agglutinated (clumped) cells are destroyed, releasing contents → kidney failure, jaundice, etc.*

ABO Blood Types

Erythrocytes	<p>Antigen A</p> 	<p>Antigen B</p> 	<p>Antigens A and B</p> 	<p>Neither antigen A nor B</p> 
Plasma	<p>Anti-B antibodies</p> 	<p>Anti-A antibodies</p> 	<p>Neither anti-A nor anti-B antibodies</p>	<p>Both anti-A and anti-B antibodies</p> 
Blood type	<p>Type A Erythrocytes with type A surface antigens and plasma with anti-B antibodies</p>	<p>Type B Erythrocytes with type B surface antigens and plasma with anti-A antibodies</p>	<p>Type AB Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies</p>	<p>Type O Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies</p>

INCOMPATIBLE BLOOD TRANSFUSIONS

- Major concern: the agglutinins (antibodies) in the recipient's plasma react with the agglutinogens (antigens) on cells in the transfused donor blood



Blood Transfusions cont.

- *Less serious issue*: the agglutinins (antibodies) in the donor's plasma react with the agglutinogens (antigens) on the recipient's blood cells
 - *Donor's plasma becomes very diluted once in the recipient, so this is less likely to cause a reaction*

THEORETICAL TRANSFUSIONS

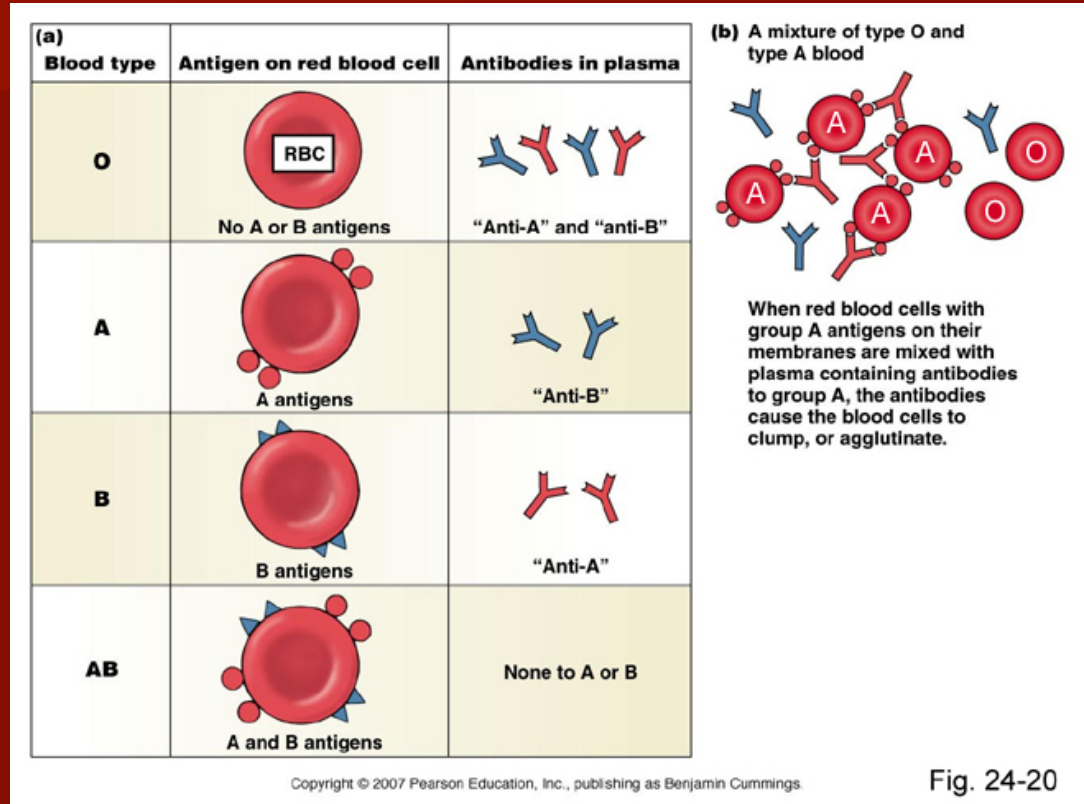
Type A → A, O

Type B → B, O

Type AB → AB, A, B, O
Universal Recipient!!

Type O → O
Universal Donor!!

**Emergency only -could have a secondary reaction*



Rh Factor Blood Group

Inherited just like ABO
Blood Type

85% Rh+



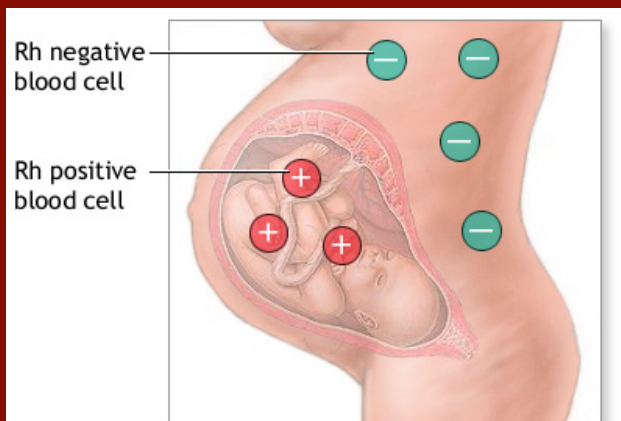
Has Rh agglutinogens
(factors on red blood cell)

15% Rh-



No Rh agglutinogens

- Anti-Rh agglutinins (antibodies) only form when Rh- blood is exposed to Rh+ cells
 - Normally there are no Rh antibodies in plasma
- How exposed???
- Transfusion
- Exposure in pregnant mother
 - Rh- mom has a Rh+ baby



Erythroblastosis Fetalis

a.k.a. Hemolytic Disease of the Newborn (HDN)

Occurs when the Rh+ blood of baby mixes with Rh- blood of mother (*usually at delivery, when placenta starts to break down*)

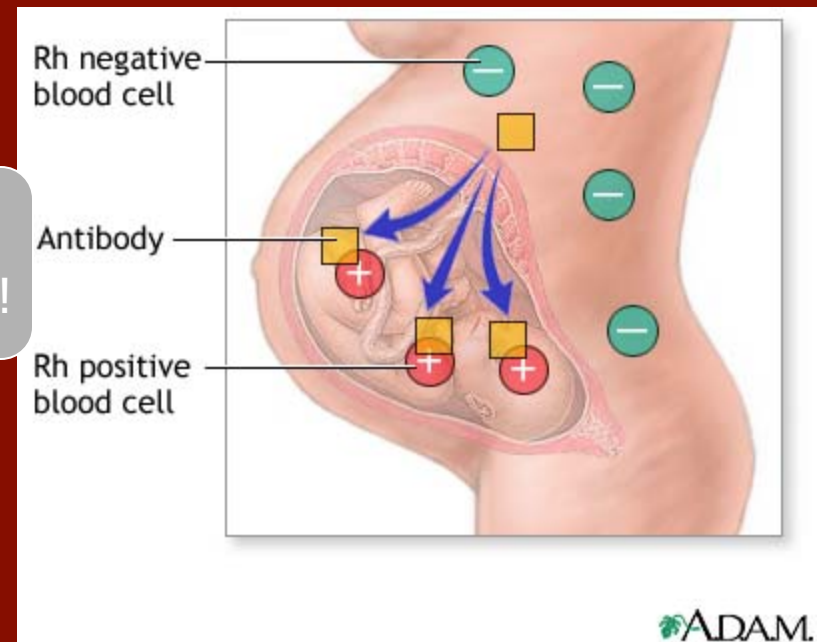
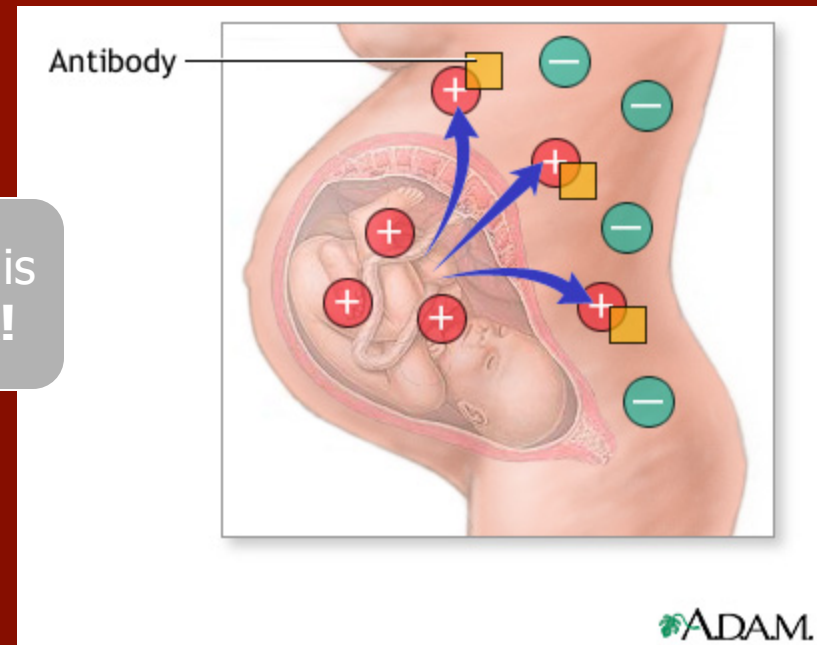
Agglutinins form in the blood of the mother

Those antibodies will get into NEXT Rh+ baby and cause HDN

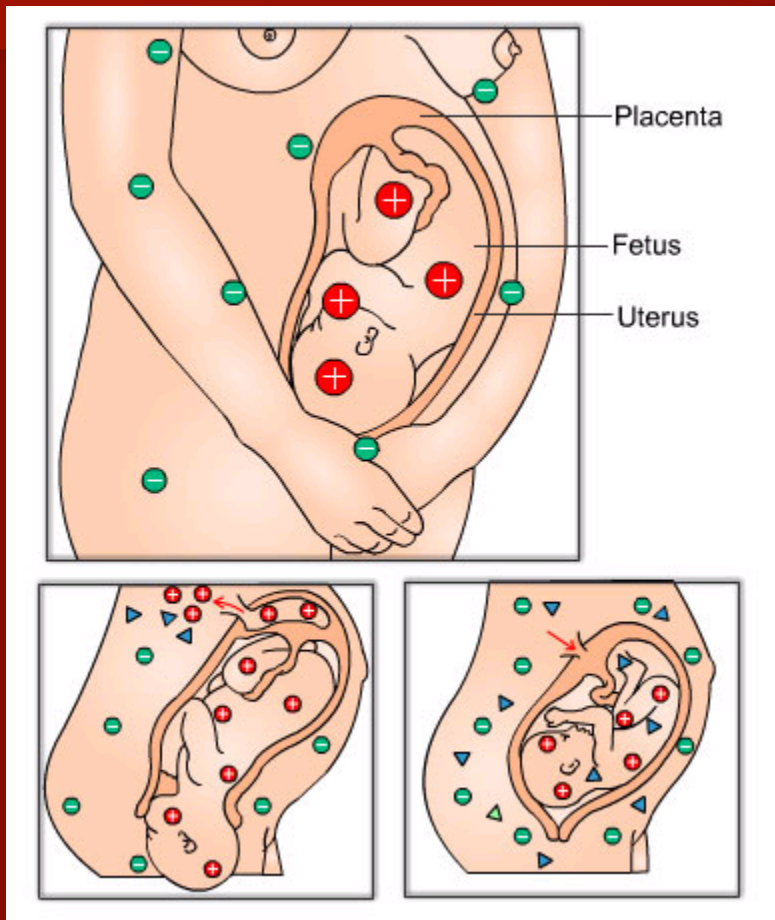
What if it's a Rh- baby? Would it be affected??

First baby is born **a-ok!**

Next Rh+ baby has it!



Symptoms in infant



- Anemia
- Jaundice
- Immature red blood cell destruction
- Brain damage
- Mental retardation