

# ABO BLOOD GROUPING & Rh GROUPS

# Objectives

- to determine the blood group and therefore the type of antigen carried on the surface of erythrocytes in the ABO system.
- to test for the availability of the Rh factor (D antigen) on the surface of erythrocytes

- **The ABO system** is associated with three blood group substances (antigens) on erythrocytes designated as the A, B and H antigens. These antigens have the following antigenic determinants at the non-reducing termini of oligosaccharides

- blood group antigens are **not found** only as part of erythrocyte membrane but also found in a wide variety of tissues and biological fluids such as saliva, milk , seminal fluid, urine , and gastric juice.
- Blood group antigens must be determined to secure a safe practice of blood transfusion.

# Genetics of Blood Types

- Your blood type is established before you are **BORN**, by specific **GENES** inherited from your parents.
- You inherit one gene from your **MOTHER** and one from your **FATHER**.
- These genes determine your blood type by causing proteins called **AGGLUTINOGENS** to exist on the surface of all of your red blood cells.



# What are blood types?

There are 3 alleles or genes for blood type: A, B, & O. Since we have 2 genes, there are 6 possible combinations.

## Blood Types








AA or AO = Type A

BB or BO = Type B

OO = Type O

AB = Type AB

## The ABO Blood System

Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood Cell Surface Proteins (phenotype)	 A agglutinogens only	 B agglutinogens only	 A and B agglutinogens	 No agglutinogens
Plasma Antibodies (phenotype)	 b agglutinin only	 a agglutinin only	NONE. No agglutinin	 a and b agglutinin

# Blood Typing

Blood type is based on the presence of 2 major antigens in RBC membranes-- A and B

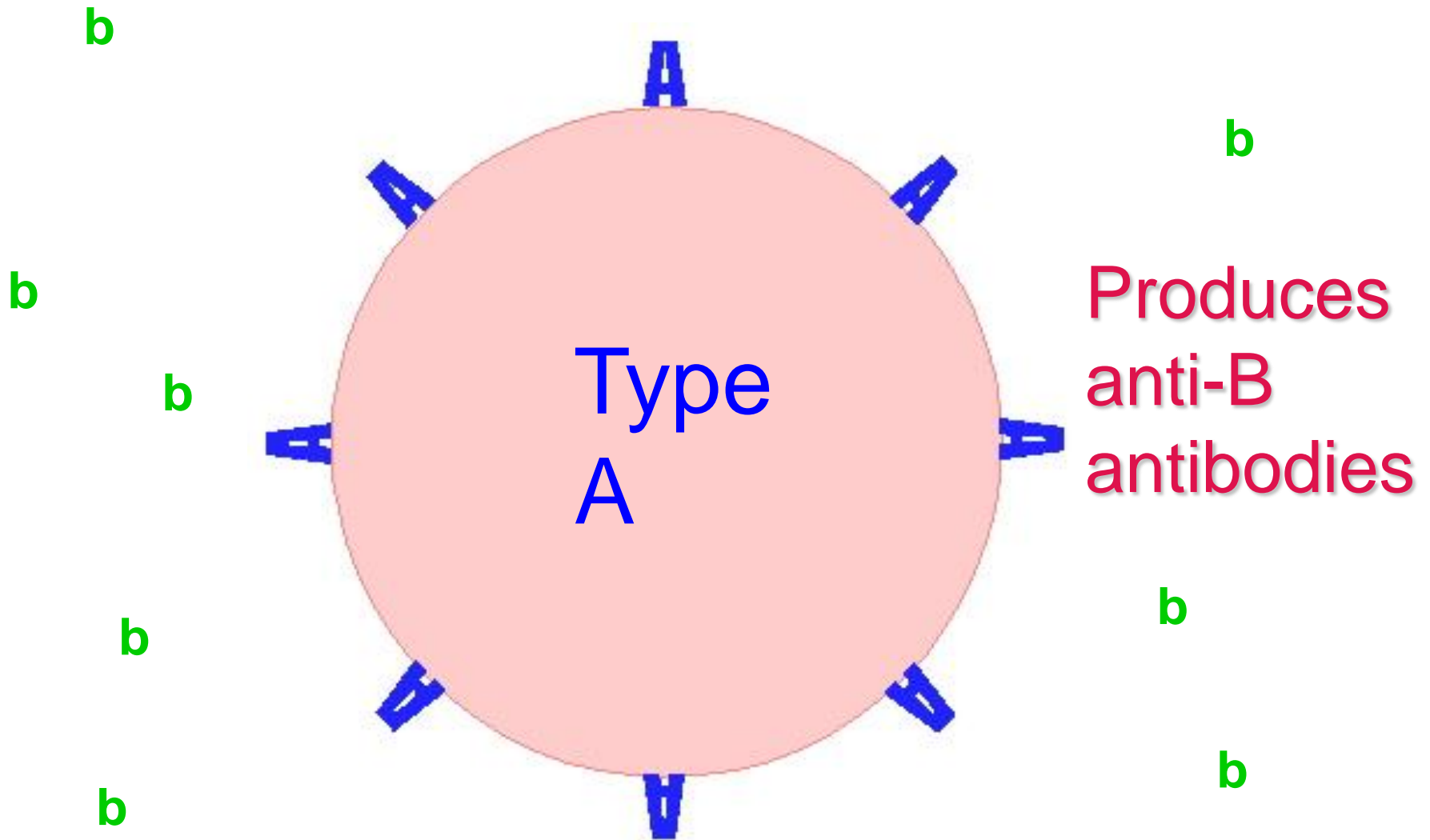
<u>Blood type</u>	<u>Antigen</u>	<u>Antibody</u>
A	A	anti-B
B	B	anti-A
A & B	AB	no anti body
Neither A or B	O	anti-A and anti-B

**Antigen**- protein on the surface of a RBC membrane

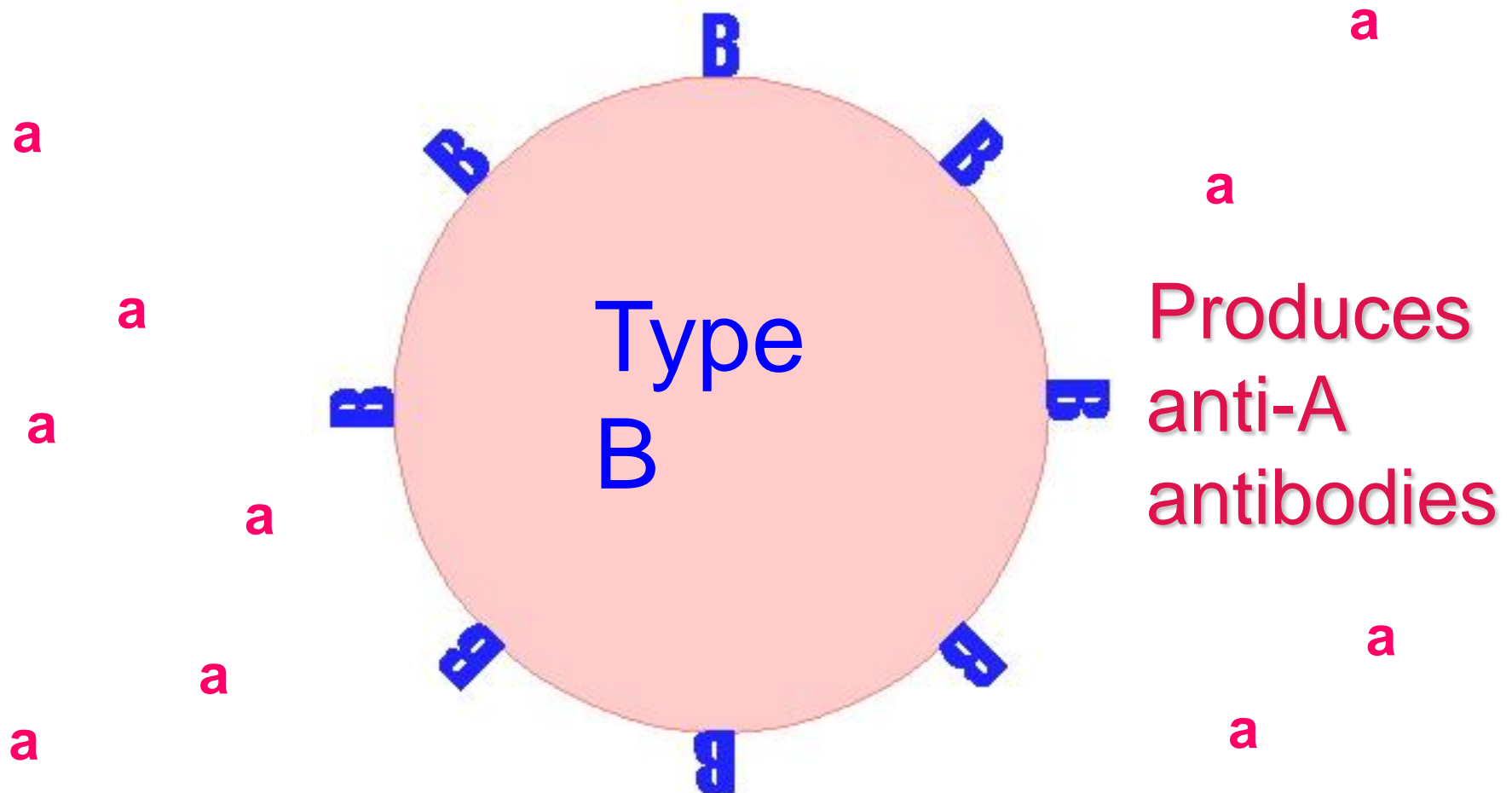
**Antibody**- proteins made by lymphocytes in plasma which are made in response to the presence of antigens.

They attack foreign antigens, which result in clumping (agglutination)

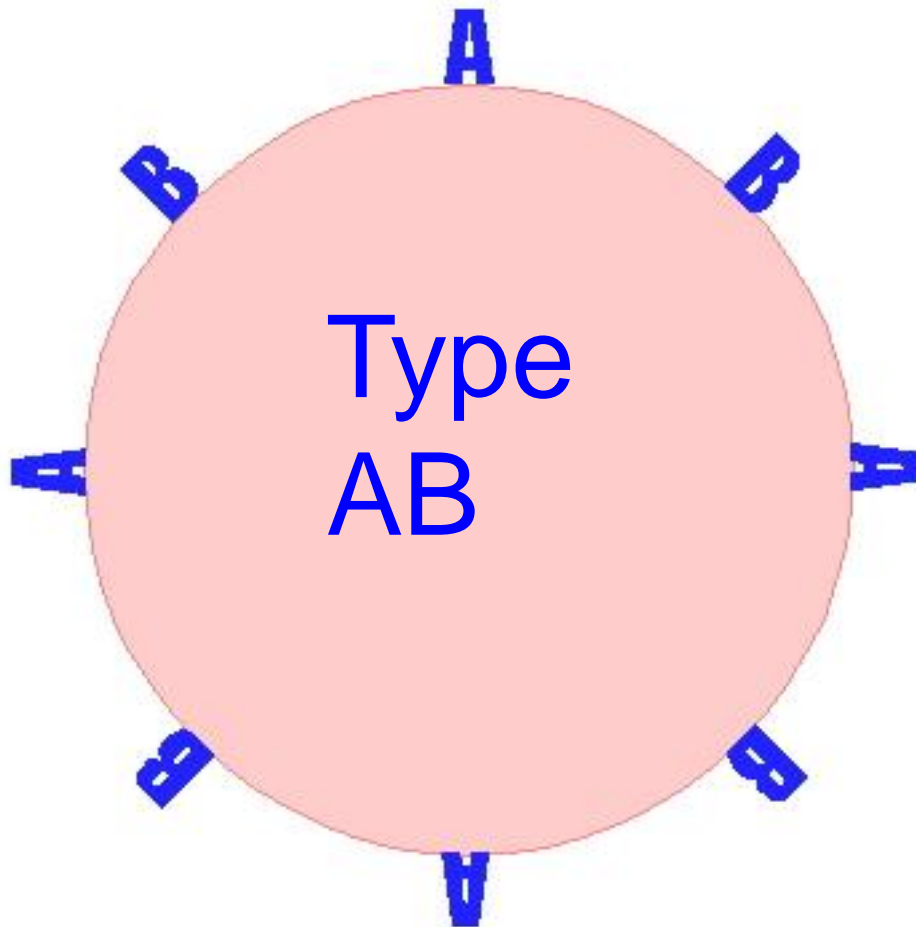
# ABO Blood Types



# ABO Blood Types

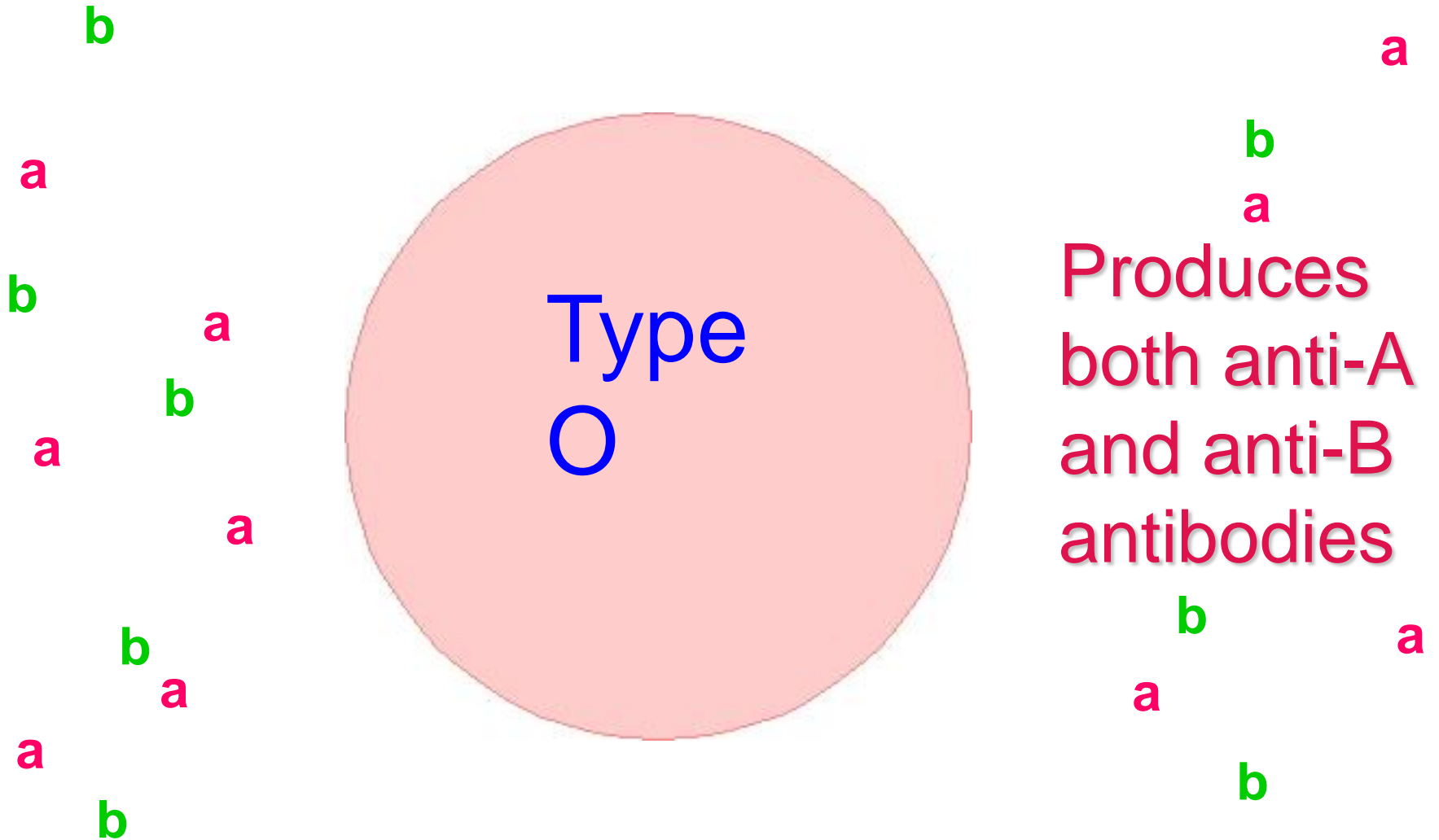


# ABO Blood Types



Produces  
neither  
anti-A nor  
anti-B  
antibodies

# ABO Blood Types



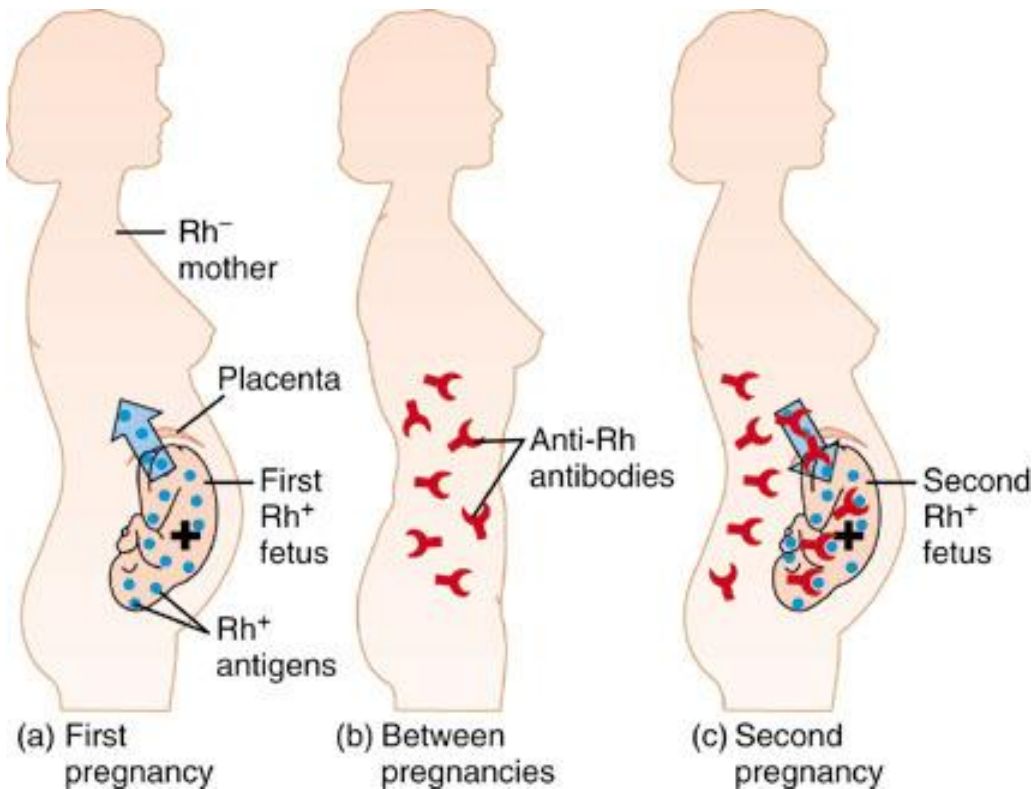
# Rh Blood Group



- First studied in rhesus monkeys
- Types
  - **Rh positive**: Have these antigens present on surface of RBCs
  - **Rh negative**: Do not have these antigens present
- Hemolytic disease of the newborn (**HDN**)
  - Mother produces anti-Rh antibodies that cross placenta and cause agglutination and hemolysis of fetal RBCs

**A+ A-  
B+ B-  
AB+  
AB-  
O+ O-**

# Rh Factor and Pregnancy

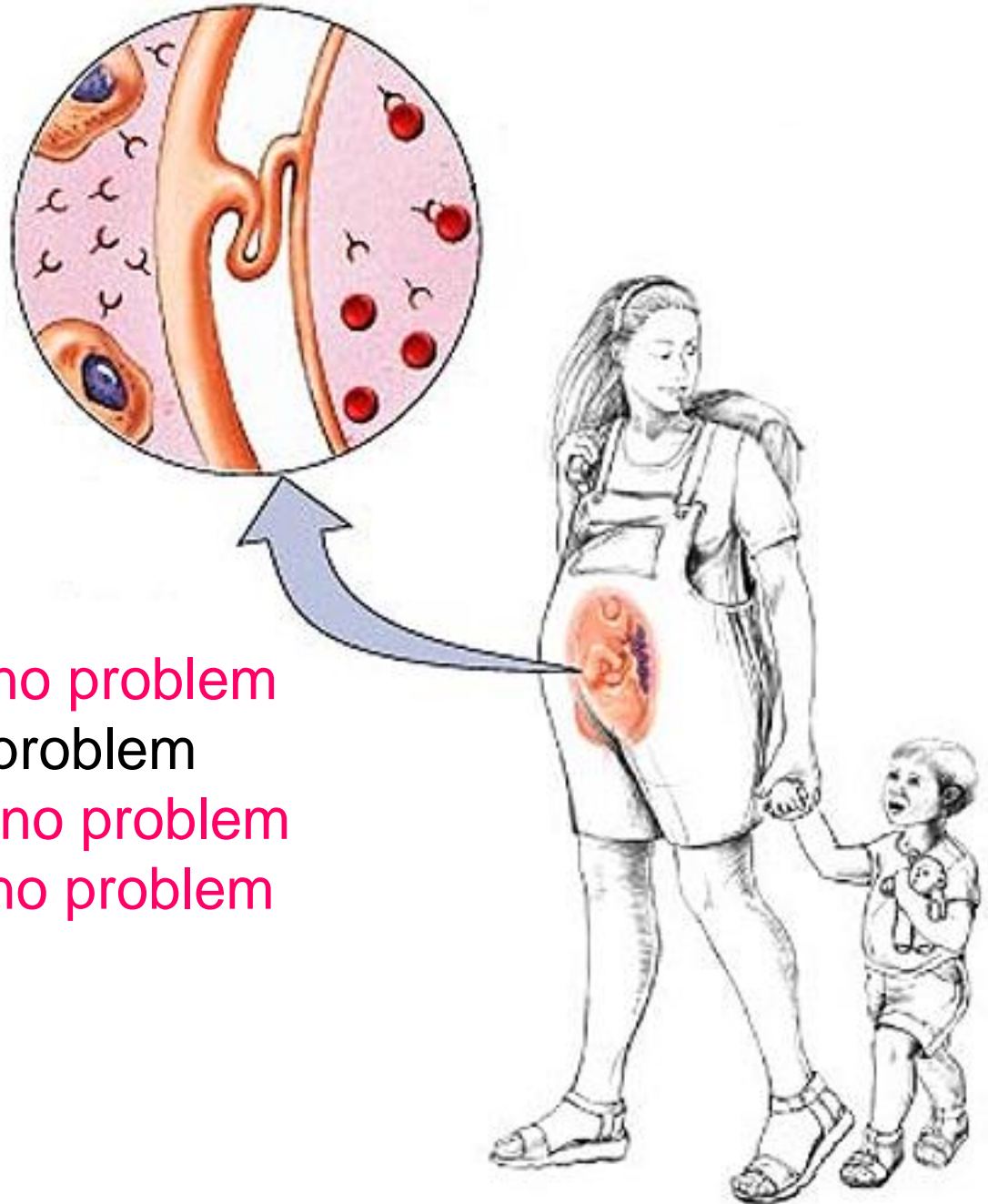


RH+ indicates protein

RH- indicates no protein

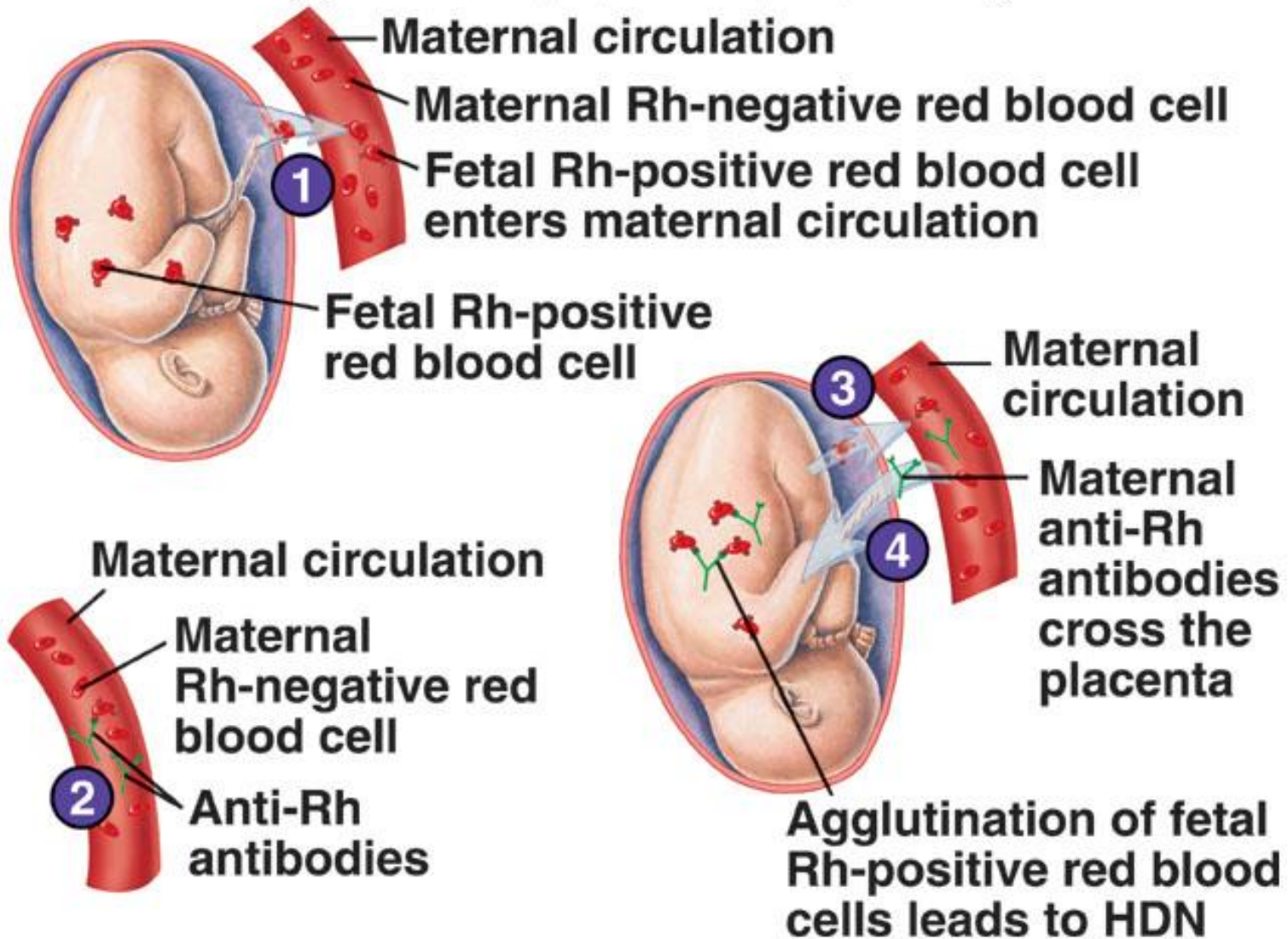
# Rh Factor and Pregnancy

Rh<sup>+</sup> mother w/Rh<sup>-</sup> baby— no problem  
Rh<sup>-</sup> mother w/Rh<sup>+</sup> baby— problem  
Rh<sup>-</sup> mother w/Rh<sup>-</sup> father— no problem  
Rh<sup>-</sup> mother w/Rh<sup>-</sup> baby-- no problem



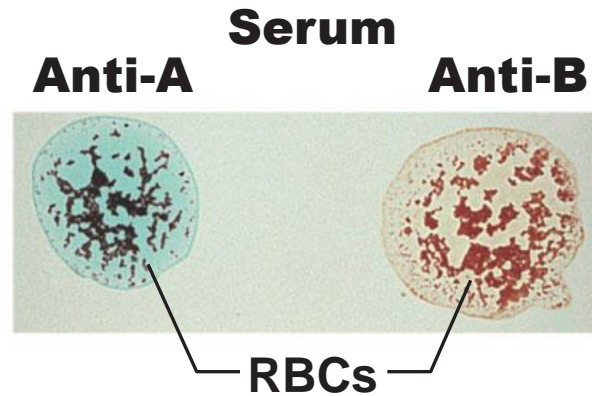
# Erythroblastosis Fetalis

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## Blood being tested

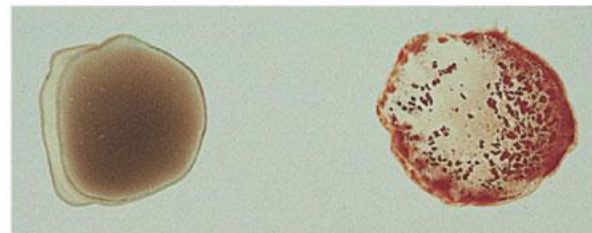
**Type AB** (contains agglutinogens A and B; agglutinates with both sera)



**Type A** (contains agglutinin A; agglutinates with anti-A)



**Type B** (contains agglutinin B; agglutinates with anti-B)



**Type O** (contains no agglutinogens; does not agglutinate with either serum)

