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team



# 12 Blood Group

Quote:

There will always be somebody more successful or talented, but you are not running their race. You are running your own RACE.

# Objectives



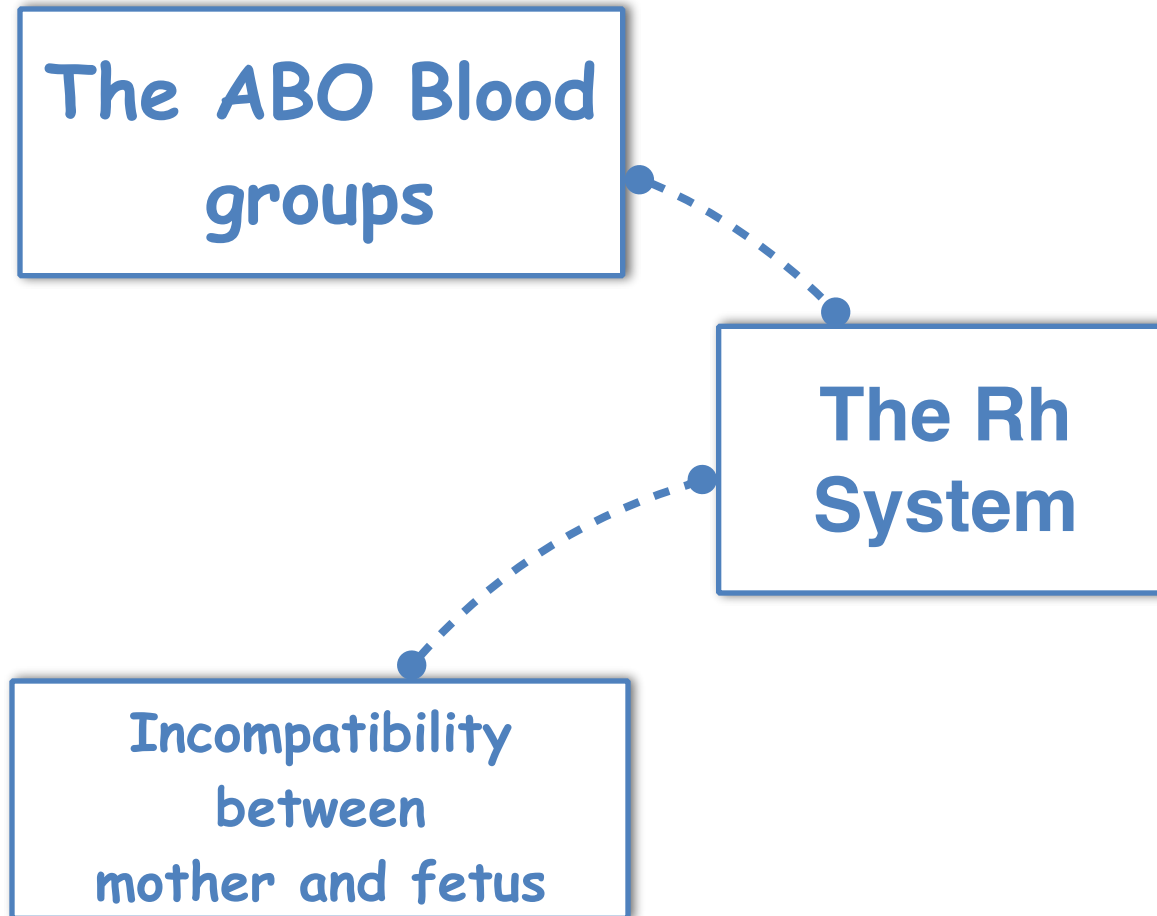
- Describe ABO blood group types
- Recognize Agglutinins in plasma
- Recognize transfusion (cross) reactions
- Describe Rhesus blood groups.
- Describe causes of hemolytic disease of the newborn.



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# Mind Map



# The ABO Blood groups

1. Discovered in 1901 by Dr. Karl Landsteiner
2. It's 4 main phenotypes (A, B, AB, O)
3. ABO gene located on the long arm of chromosome 9.



Karl Landsteiner  
(1868-1943)

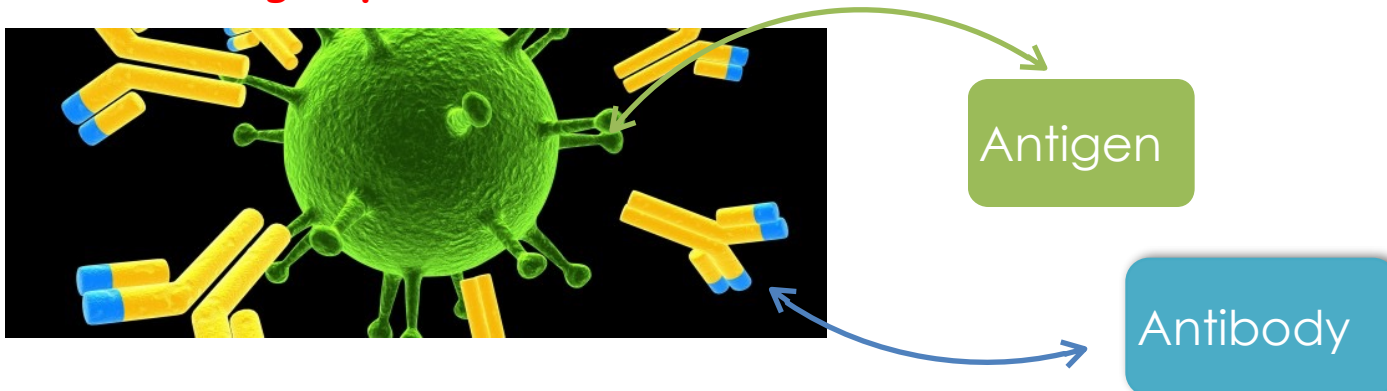


# The ABO Blood groups



- A. RBC(red blood cells) membranes have glycoprotein antigens on their external surfaces.
- B. Human erythrocytes has >300 antigenic determinants
- C. These antigens are:
  1. unique to the individual
  2. promoters of agglutination and are referred to as agglutinogens
  3. recognized as 'foreign'/non-self if transfused into another individual

D. Presence or absence of these antigens is used to classify blood groups





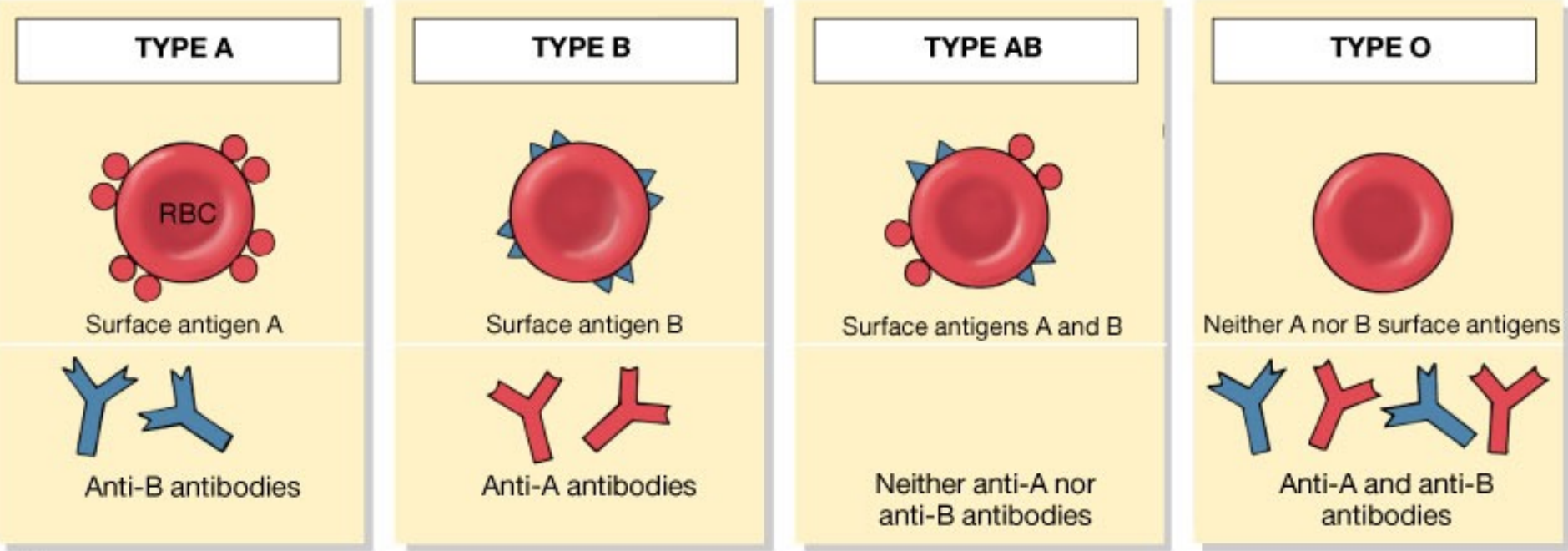
# The ABO Blood groups



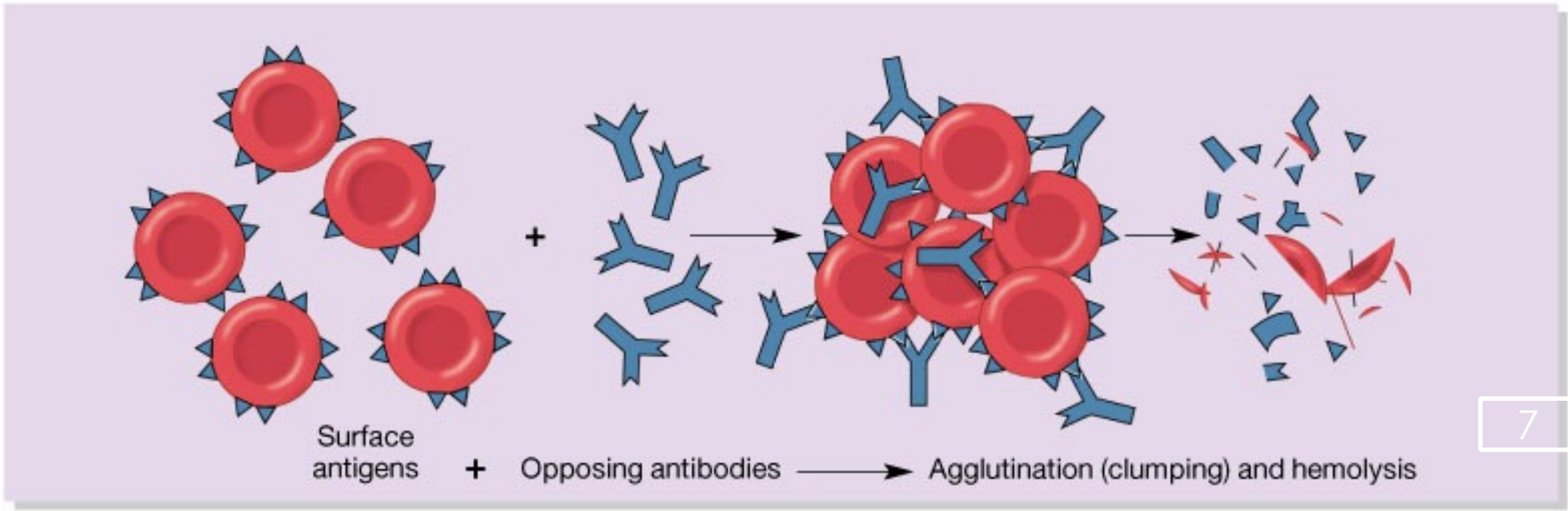
There are two antigens and two antibodies that are mostly responsible for the ABO types.

Thus, the presence or absence of these Ag's is the essential basis that blood is grouped for the purpose of transfusion

ABO Blood type	Antigen-A	Antigen-B	Antibody Anti-A	Antibody anti-B
A	yes	no	no	yes
B	no	yes	yes	no
O	no	no	yes	yes
AB	yes	yes	no	no



(a)



(b)



# The ABO Blood groups



## O Blood Type

Because type O lacks Ags, type O blood does not cause an immune response.

This is why type O blood cells can be given to patients of any blood type. People with type O blood are called "universal donors."

However, people with type O can only receive type O blood.

Type AB has both Ag A & B but lack antibodies so can receive blood from other groups and therefore they are called (Universal Recipients)





# The ABO Blood groups



## More explanation :

### **Function of the A and B antigens**

The functions of the ABO blood group antigens are not known. Individuals who lack the A and B antigens are healthy, suggesting that any function the antigens have is not important, at least not in modern times.

ABO antibodies in the serum are formed naturally. Their production is stimulated when the immune system encounters the "missing" ABO blood group antigens in foods or in micro-organisms. This happens at an early age because sugars that are identical to, or very similar to, the ABO blood group antigens are found throughout nature.

The ABO blood group antigens remain of prime importance in transfusion medicine—they are the most immunogenic of all the blood group antigens. The most common cause of death from a blood transfusion is a clerical error in which an incompatible type of ABO blood is transfused.



# The ABO Blood groups



	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red Blood Cell	 A antigen	 B antigen	 A and B antigens	None

Anti-A & Anti-B are :

naturally occurring antibodies

Not present at birth, appear after 2-8 months

Triggered by A & B antigens in food and bacteria

# The Rh System

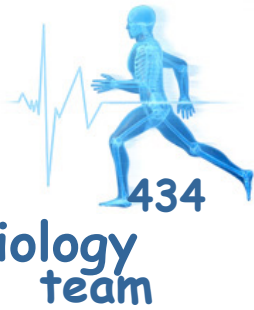


- A. Discovered by Landsteiner & Wiener in 1937
- B. Antigen discovered in the Rhesus monkey
- C. Rh is an Ag on the RBC
  - 1. a. Rh+ has the Ag (85% of the population)
  - 2. b. Rh- does NOT have the Rh antigens
  - 3. c. Rh+ can accept Rh+ or Rh- blood
  - 4. d. Rh- can accept ONLY Rh- blood



## Determined by:

- Presence or absence of the Rhesus antigen (D) on the surface of RBC:
  - Presence of D (individual is Rh+Ve)
  - Absence of D (individual is Rh-Ve)



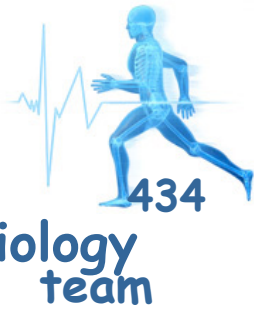
# The Rh System



## More explanation :

The Rh blood group system (including the Rh factor) is one of thirty-three current human blood group systems. It is the most important blood group system after ABO. At present, the Rh blood group system consists of 50 defined blood-group antigens, among which the five antigens **e**, **E C**, **c**, and **D** are the most important.

An individual either has, or does not have, the "Rh factor" on the surface of their red blood cells. This term strictly refers only to the most immunogenic D antigen of the Rh blood group system, or the Rh- blood group system. The status is usually indicated by Rh positive (Rh + does have the D antigen) or Rh negative (Rh- does not have the D antigen)



# The Rh System



## Rh incompatibility between mother and fetus

Rh incompatibility is a condition that develops when a pregnant woman has Rh-negative blood and the baby in her womb has Rh-positive blood.

**During pregnancy, red blood cells from the unborn baby can cross into the mother's bloodstream through the placenta.**

**If the mother is Rh-negative, her immune system treats Rh-positive fetal cells as if they were a foreign substance and makes antibodies against the fetal blood cells. These anti-Rh antibodies may cross back through the placenta into the developing baby and destroy the baby's circulating red blood cells.**



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## Links



I really recommend you to watch this youtube video it will clear the whole lecture for you inshallah :)

<https://www.youtube.com/watch?v=KXTF7WehgM8>

And these links if you interested about the Object

The ABO blood group :

<http://www.ncbi.nlm.nih.gov/books/NBK2267/>

Rh factor :

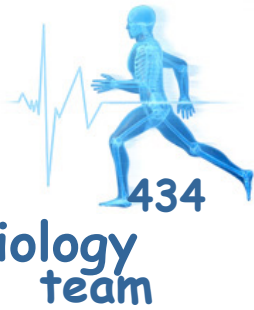
[http://en.wikipedia.org/wiki/Rh\\_blood\\_group\\_system](http://en.wikipedia.org/wiki/Rh_blood_group_system)

Rh incompatibility between mother and fetus :

<http://www.nlm.nih.gov/medlineplus/ency/article/001600.htm>

## Check your Understanding

1. Which of the following statements is true regarding the ABO blood system?
  - a) People who have the A antigen normally would not produce the anti-A antibody.
  - b) People who are type AB normally produce both anti-A and anti-B antibodies.
  - c) The only ABO type blood that normally does not have either A or B antigens is AB.
2. The universal blood donors for the ABO system are type:
  - a) A
  - b) B
  - c) O
  - d) AB
3. In determining the phenotype for the ABO blood system:
  - a) O is dominant over A
  - b) B is dominant over A
  - c) O is recessive
  - d) all of the above



## Check your Understanding



4) Mother-fetus Rh blood type incompatibility problems can occur if the mother is \_\_\_\_\_ and her fetus is \_\_\_\_\_

- a) Rh positive; Rh positive
- b) Rh positive; Rh negative
- c) Rh negative; Rh positive
- d) Rh negative; Rh negative

5) Which of the following is true of Rh positive people?

- a) They are either homozygous dominant (DD) or heterozygous (Dd) for this trait.
- b) They are all homozygous dominant (DD).
- c) They are all homozygous recessive (dd).
- d) They are either homozygous recessive (dd) or heterozygous (Dd) for this trait.

^\*The Rh blood factor is a dominant trait. Therefore, both DD and Dd people have the Rh antigen on the surface of their red cells which makes them Rh positive.

Done by :

عبدالرحمن أبوستة

- Ⓓ (5)
- Ⓒ (4)
- Ⓒ (3)
- Ⓒ (2)
- Ⓓ (1)