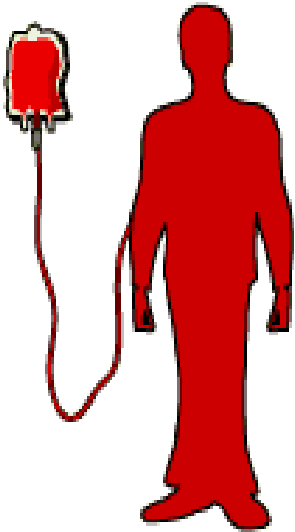
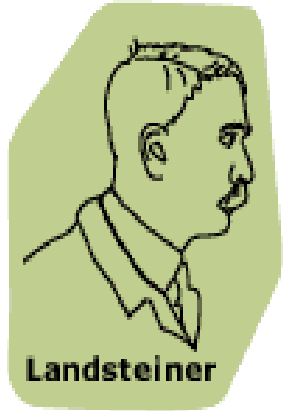
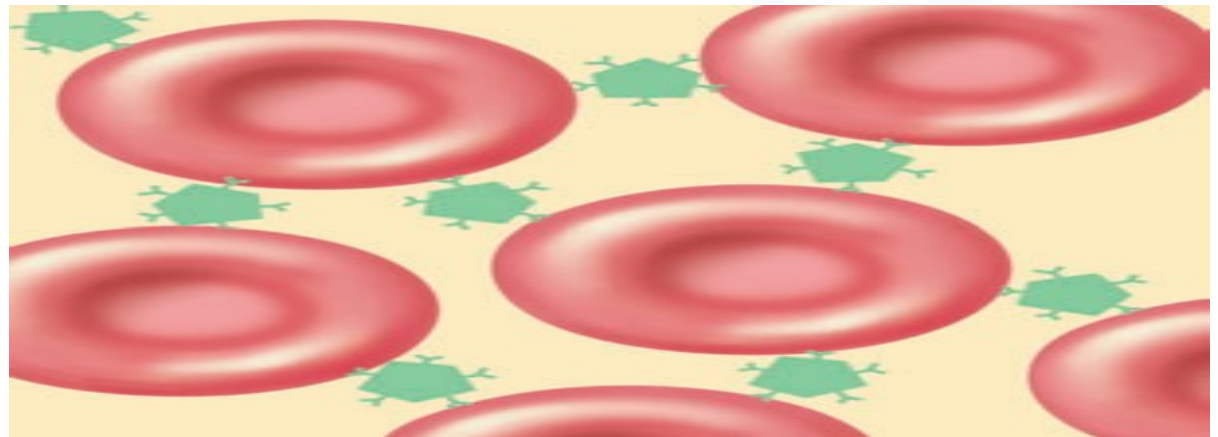


Discovery of blood groups

Awarded for noble prize in physiology



- Mixing blood from two individuals can lead to blood clumping or agglutination.
- The clumped red cells can break and cause toxic reactions.



BLOOD GROUPS

- DISCOVERED BY LANDTEINER IN 1901.
- **ABO SYSTEM**
- **RH SYSTEM**
- MN SYSTEM
- **ANTIGENS: RBC MEMBRANE**
- **ANTIBODY: SERUM**

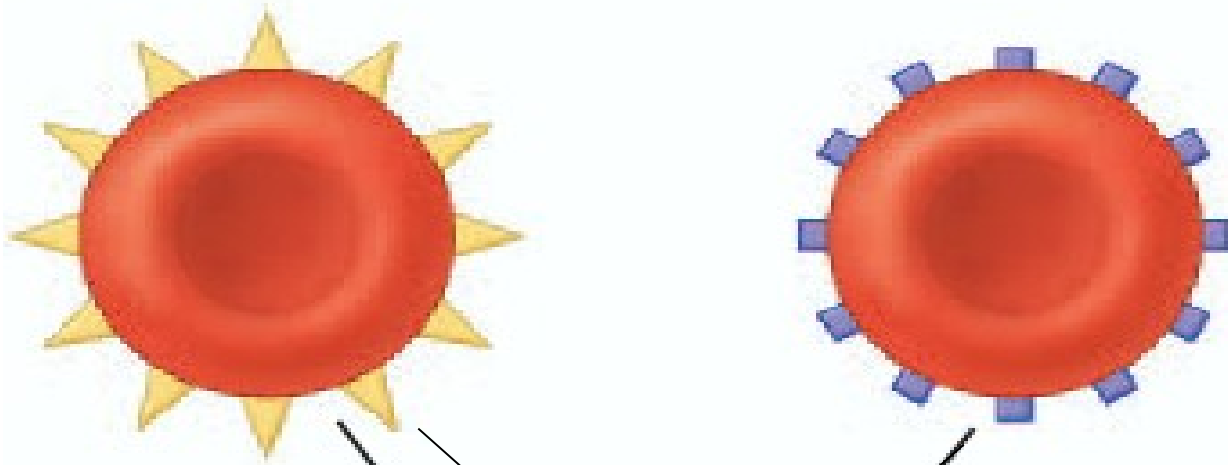
ABO SYSTEM

- Two Antigens - Agglutinogen
- Present on RBC membrane

Antigen A ----- # Antigen B

Blood groups

1. A
2. B
3. AB
4. O



Glycoprotein (antigen)

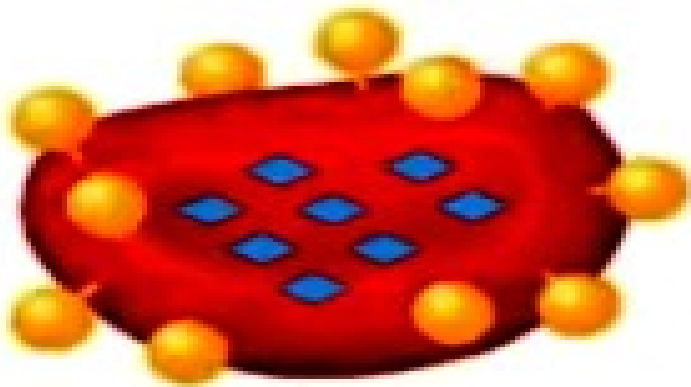


It is considered Foreign if injected in the other persons blood



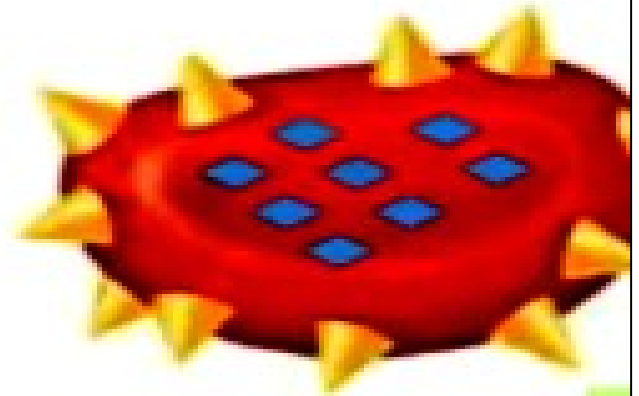
Agglutinated and destroyed

Antigen A



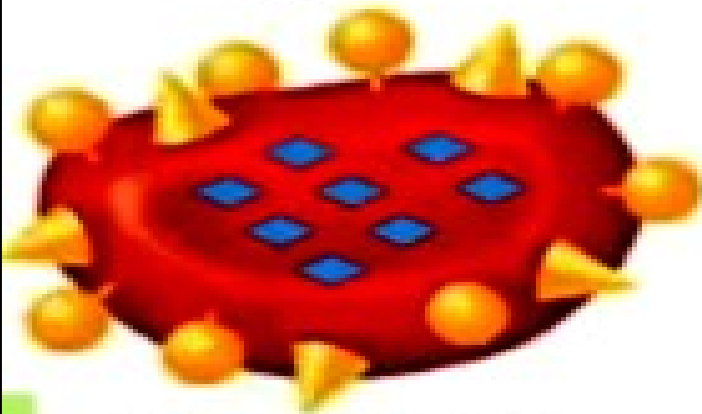
Blood Type A

Antigen B



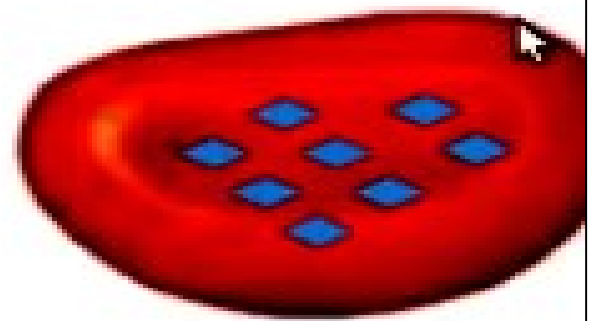
Blood Type B

Antigen A and B



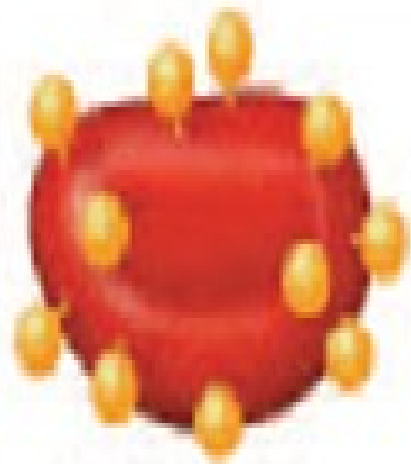
Blood Type AB

**Neither antigen
A nor B**



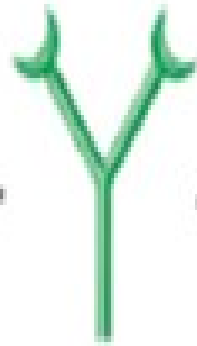
Blood Type O

- **Two Antibodies – Agglutinin --- plasma**
- **Anti – A ----- Anti – B**
- Naturally occurring.
- **IgM type.**
- **They can not cross placenta.**
- They are **cold antibodies** ----- act best at low temp.(**0 – 20° C**)
- 10 binding sites
- Hemolysins

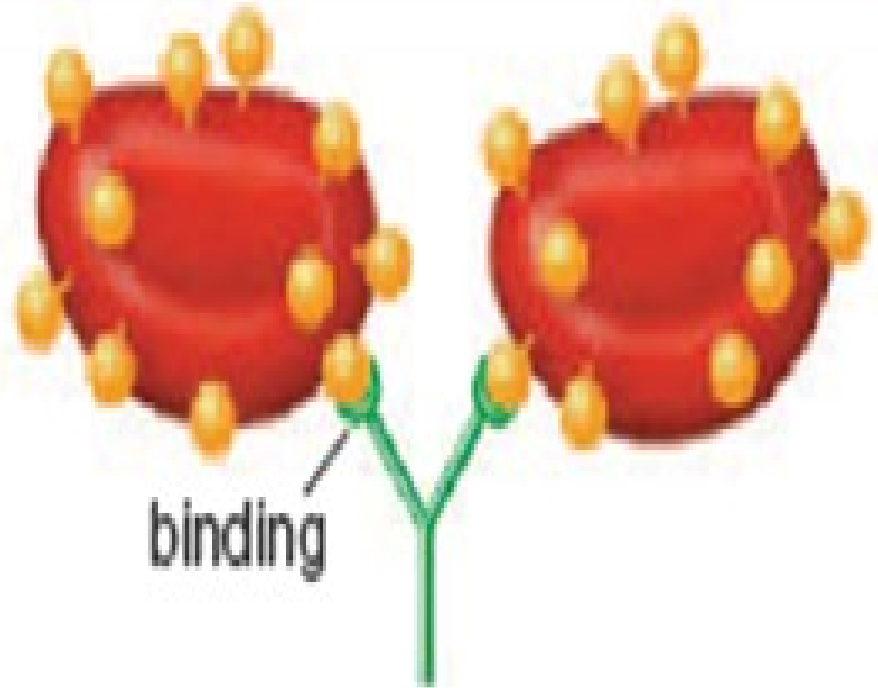
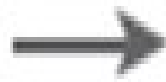


type A blood

+

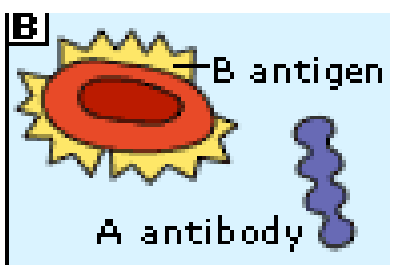
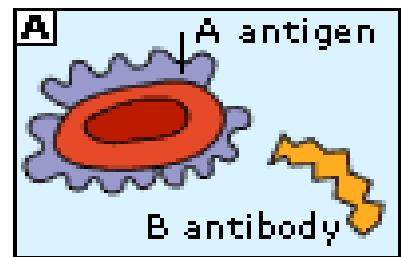
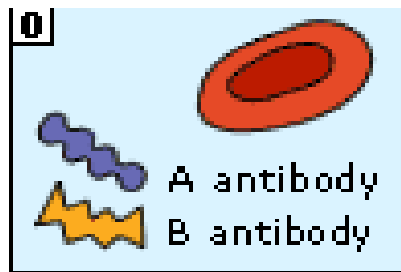
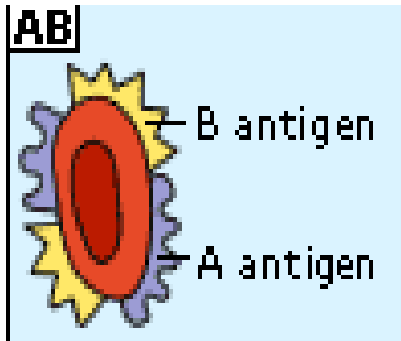


anti-A antibody

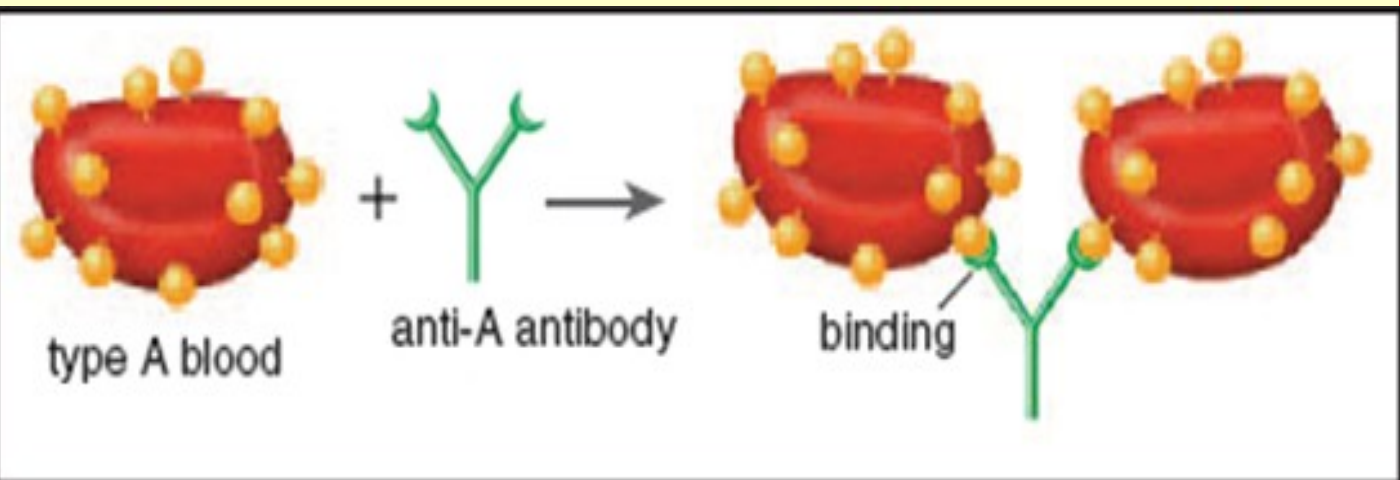


binding

LANDSTEINER'S LAW



1. If an antigen is present on the RBC corresponding antibody must be absent in serum.
2. If a particular antigen is absent on RBC corresponding antibody is present in serum.



ABO BLOOD GROUP SYSTEM

<u>BLOOD GROUP</u>	<u>ANTIGEN: RBC</u>	<u>ANTIBODY IN SERUM</u>
A	A	ANTI B (BETA)
B	B	ANTI A (ALPHA)
AB	A & B	NO ANTIBODY
O	NO ANTIGEN	ANTI A & ANTI B

LANDSTEINER'S LAW

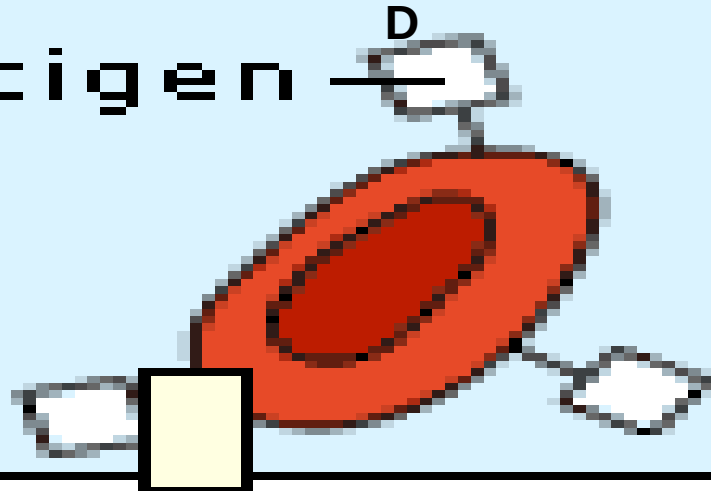
1. If an antigen is present on the RBC , corresponding antibody must be Absent in serum.
2. If a particular antigen is absent on RBC , corresponding antibody is present in serum.

RH SYSTEM

- **RH factor --- D antigen**
- D is present ---- RH positive
- D is absent ----- RH negative
- **Anti - D antibodies**
 - **IgG type.**
 - They **can cross the placenta.**
 - They act best at body temp. --- **Warm antibodies .**
 - 2 binding sites

Rh⁺

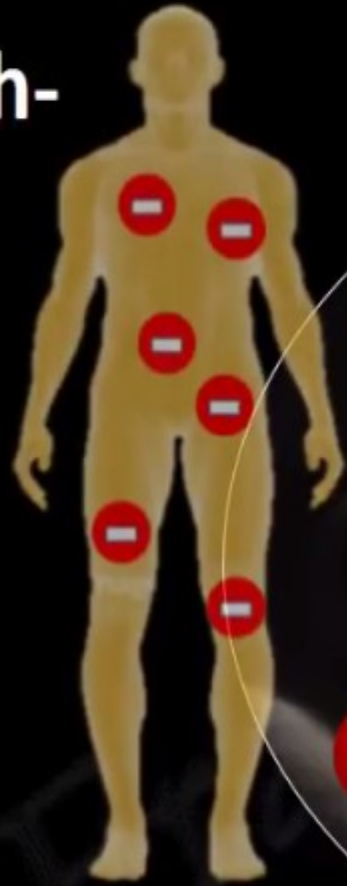
Rh antigen



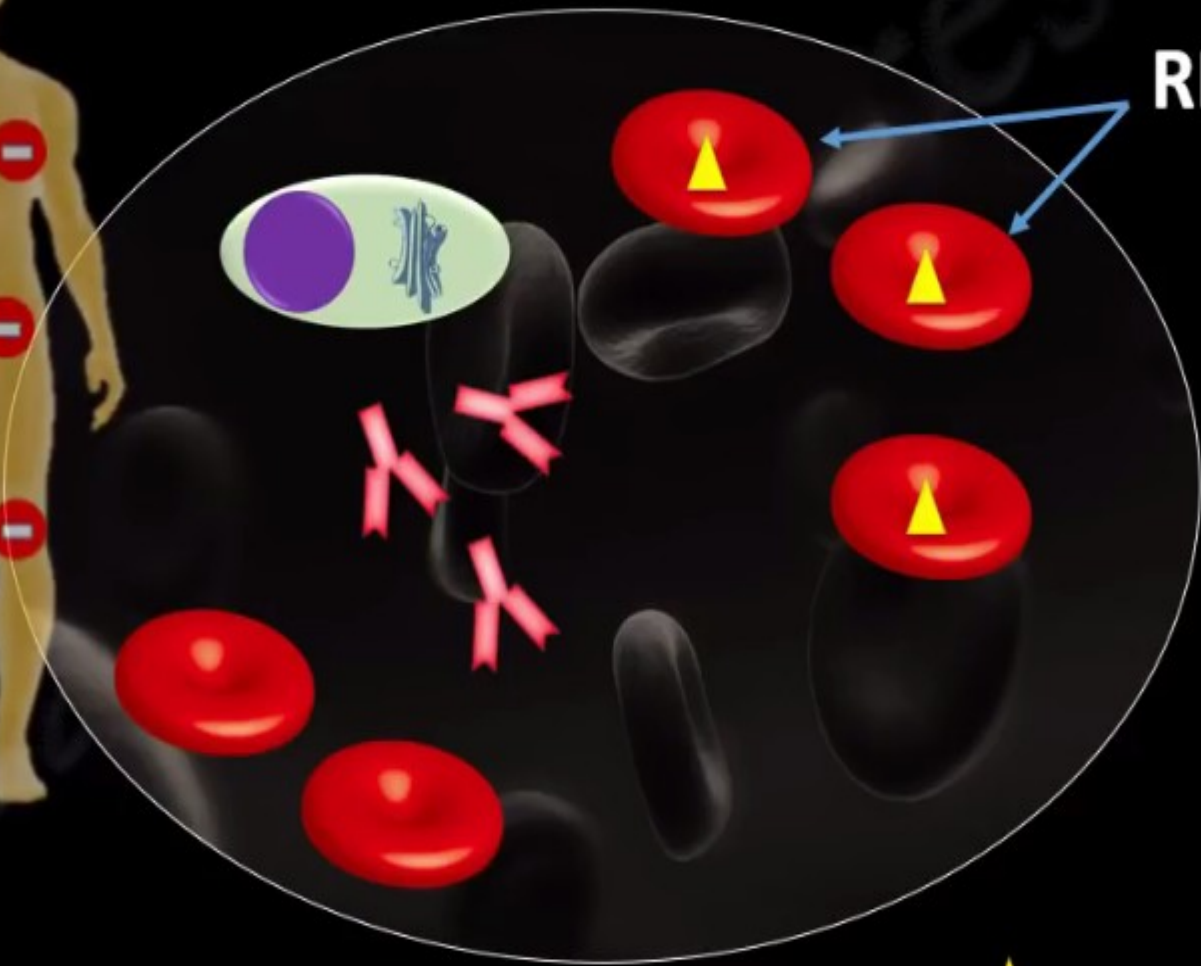
Rh⁻



Rh-



Rh+ Donor's
RBCs



Anti-Rh Antibodies



Rh Antigen

CROSS MATCHING

- **Major cross matching**
(Donor's RBC + Recipient's plasma)
- **Minor cross matching**
(Donor's plasma + Recipient'RBC)
- **Universal Donor --- O negative**
- **Universal Recipient --- AB positive**

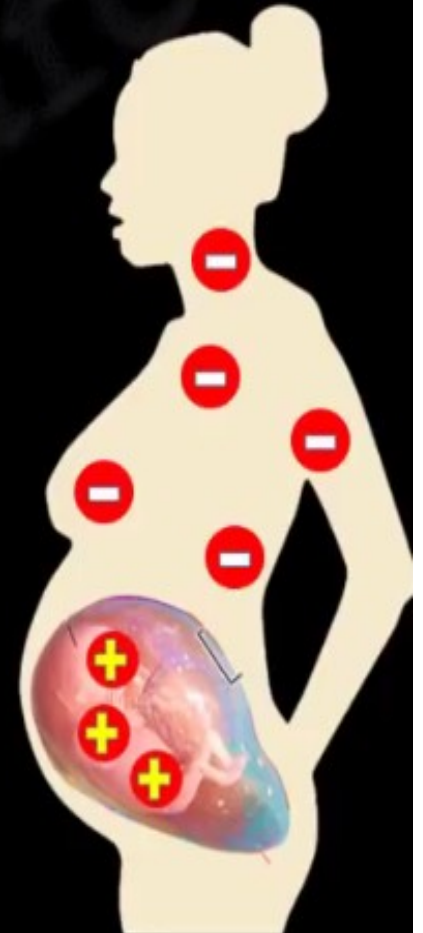
RH incompatibility

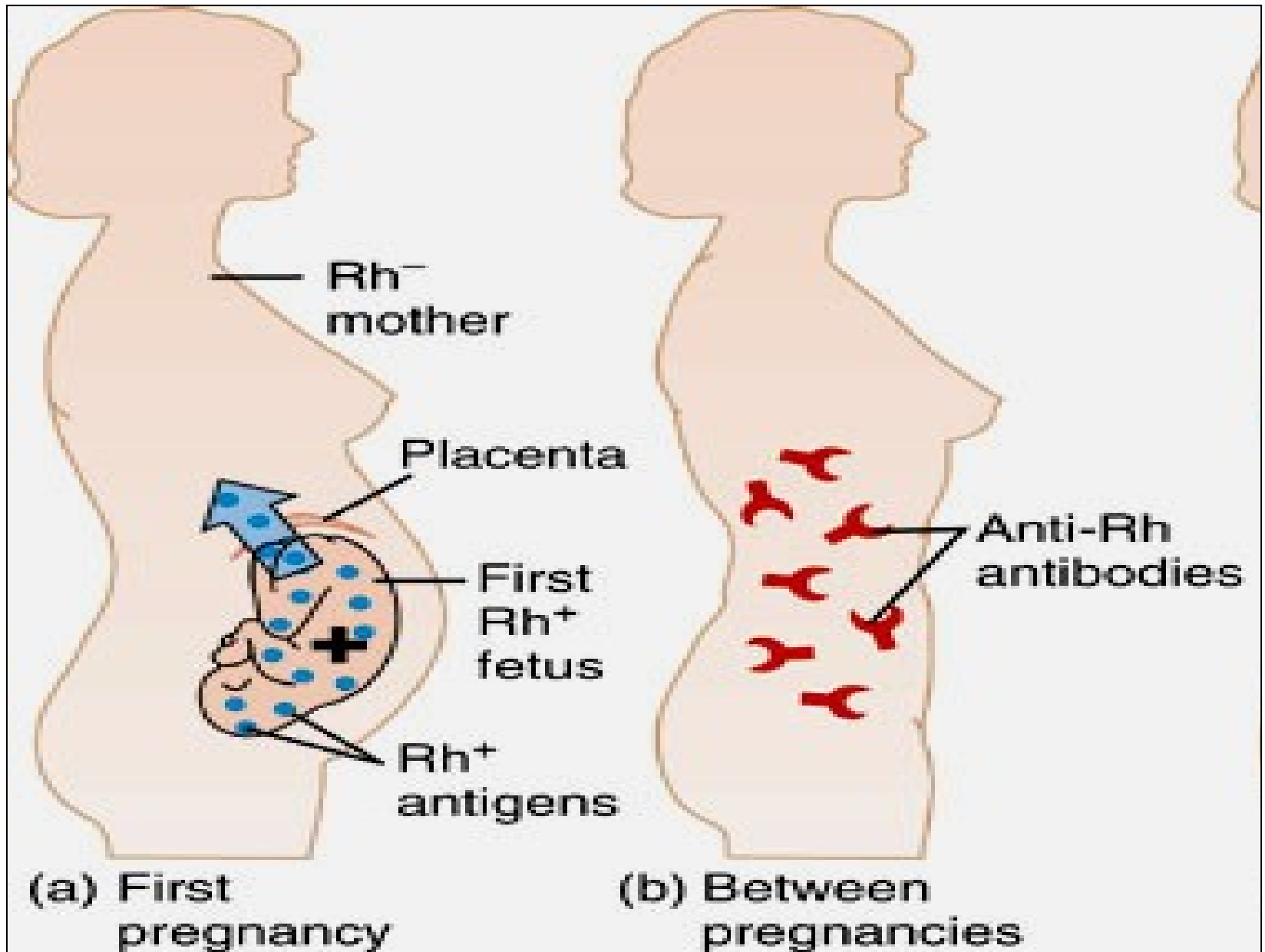
Erythroblastosis fetalis --- HDN

- Cause
- Mechanism
- Clinical features
- Treatment
- Prevention

First Pregnancy

- Rh negative mother
- Rh positive fetus

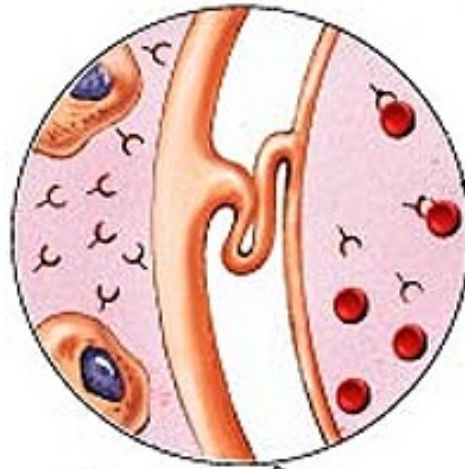




anti-Rh
antibody



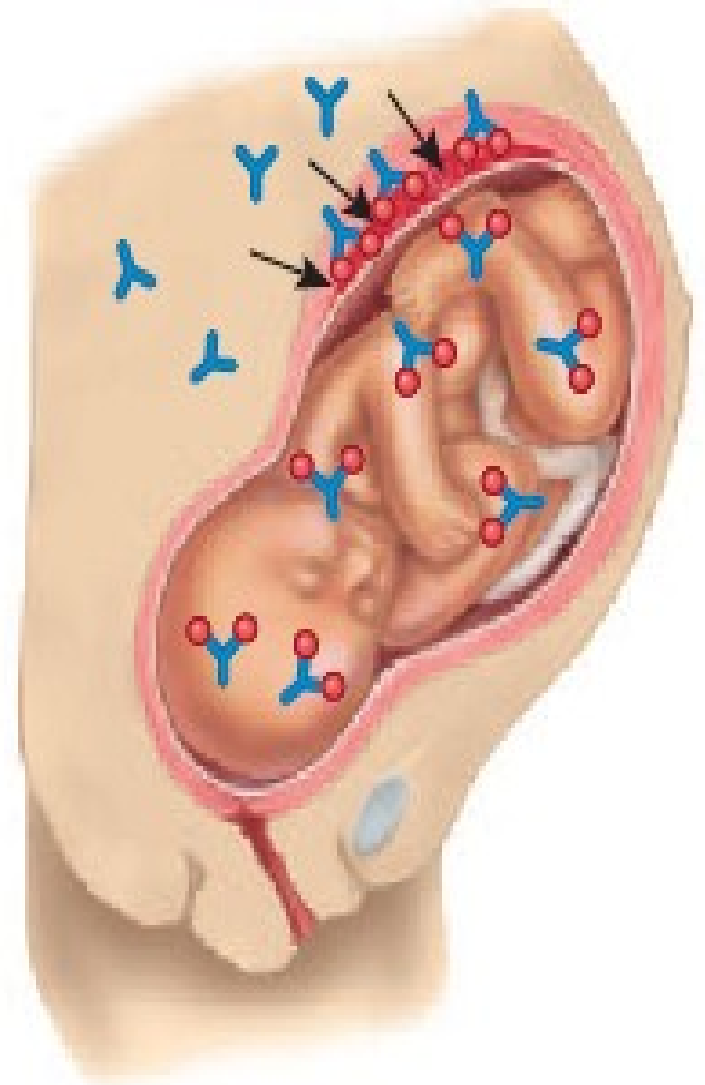
Mother makes anti-Rh
antibodies.



Hemolytic disease of the newborn or Erythroblastosis fetalis.

Clinical features

- 1) Anemia
- 2) Erythroblastosis
- 3) Jaundice
- 4) Hepatomegaly
- 5) Splenomegaly
- 6) Kernicterus
- 7) Hydrops fetalis
- 8) IUD
- 9) Renal failure



Antibodies attack Rh-positive red blood cells in child.

- **Treatment**
- **Phototherapy.**
- **An exchange transfusion**
 - The baby's Rh+ blood is removed, and Rh- blood is infused.

- **Prevention**
- It is easier to prevent than to treat.
- **Anti-D antibodies are injected to mother**
- **Just before or shortly after child birth.**
- 28 weeks of pregnancy.
- it will agglutinates the Rh factor.
- Mother's immune system is not sensitized.

Blood transfusion reactions

1. Due to mismatched transfusion

- i) Shivering & fever
- ii) Hbnemia & Hburia
- iii) Jaundice
- iv) Acute renal failure
- v) Hyperkalamia

2. Due to faulty techniques of giving blood

- i) Thrombophlebitis** ii) Air embolism

3. Due to massive transfusion

- More than 10 units of blood in 24 hrs.
- Cardiac arrhythmias ---- Cardiac arrest.

4. Febrile reaction.

5. Allergic reactions.

- itching, erythema, nausea, vomiting

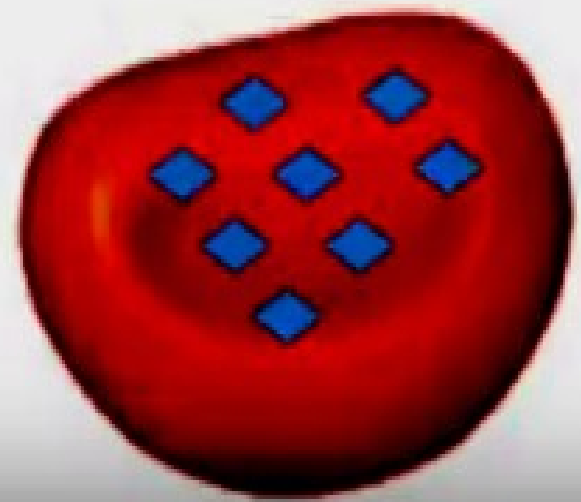
6. Transmission of diseases.

- Hepatitis , Malaria, AIDS, syphilis.

ABO blood group system

- Carbohydrate antigen.
- Derived from a parent Carbohydrate – the H antigen

The H antigen are then acted upon by two different enzymes to produce the final ABO antigen.



H gene

H substance (H-Antigen)

If A and B genes
are absent

If A and B genes are
present



H substance
converted



H substance
remains unconverted

A/B substance



No A/B antigens

A and B antigens

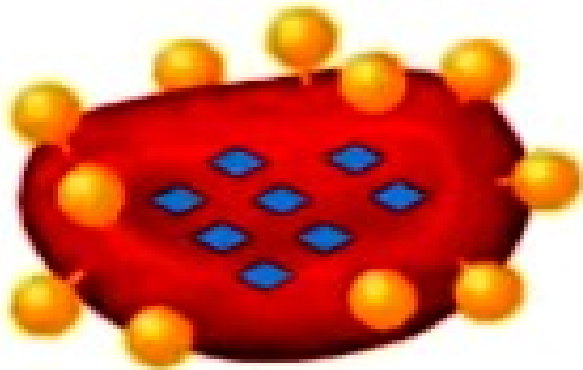


Blood group O(H+)

blood group A/B/AB(H+)

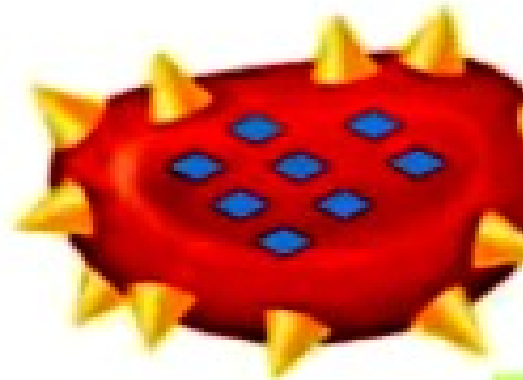
- **A and B antigens are inherited antigens**
- **These antigens are under control of A and B genes.**
- **Expression of A and B genes appears to be dependent on gene H.**
- **H gene leads to secretion of basic precursor substance H.**
- **Precursor substance is converted into H substance under the influence of A and B genes.**

Antigen A



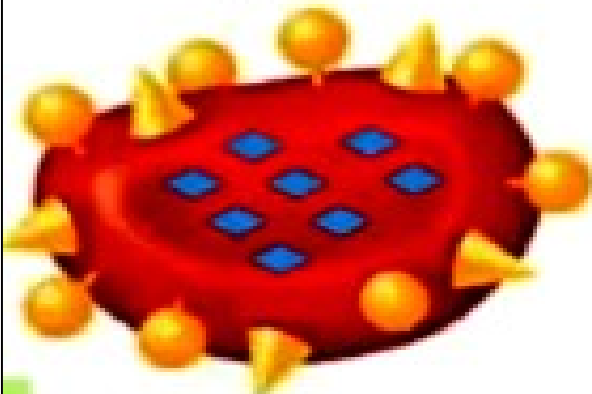
Blood Type A

Antigen B



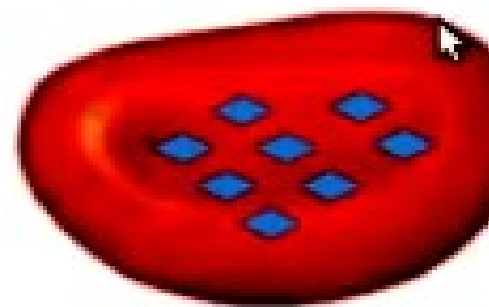
Blood Type B

Antigen A and B



Blood Type AB

Neither antigen
A nor B



Blood Type O

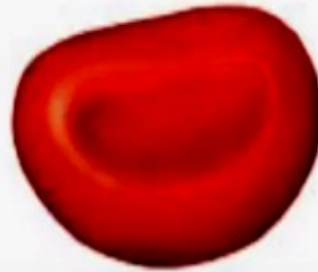
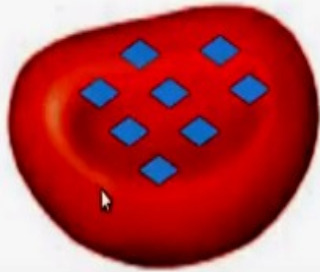
Blood group	Antigens	Antibodies
A group	H antigen and A antigen	Anti B
B group	H antigen and B antigen	Anti A
O group	H antigen	Anti A and Anti B
AB	H antigen, A antigen and B antigen	No antibody

Bombay blood group O (H substance -)

- **Bombay blood group----- lack of H genes.**
- **No H substance** is formed
- **No A and B antigen -----** even through individuals may possess A/B genes.
- So **test as group O** and -----
have anti-A, anti-B and anti-H(IgM) antibodies.
- **In O blood group , only Anti A and Anti B are present.**

O blood group

Bombay Blood gp



How is it different from the O blood group system :

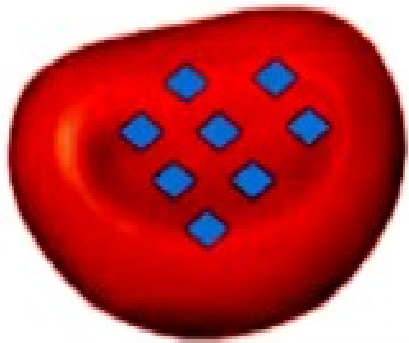
**Bombay
blood
group**

No H antigen also

O blood group has H antigen

Anti H antibody present

Not seen in O blood group.



Ok – No H antigen

so

What exactly is the problem ?

Bombay Blood group

When he receives blood :

Can not be given A or B blood

Can not be given O blood also

Why?

Because O blood group has the H antigen, and the Bombay blood group person has Antibodies to H antigen also.

Therefore such individuals can be transfused with Bombay group blood only.

ABO BLOOD GROUP SYSTEM

<u>Blood group</u>	<u>Antigen: RBC</u>	<u>Antibody in serum</u>
A	A	Anti B (beta)
B	B	Anti A (alpha)
AB	A & B	No antibody
O	No antigen(H+)	Anti A & anti B
Bombay	No antigen(H-)	Anti H, anti A and anti B