

Physiology team

430

BLOOD GROUPS

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Determined by:

Antigens (glycoprotein) on the surface RBC

The chief blood groups are: فصائل

Clinically most significant

- A-B-O System
- Rh (Rhesus) System (+ , -)

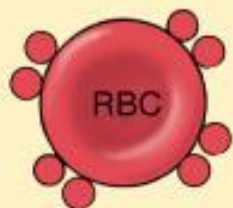
The ABO system:

- Depends on whether the red cells contain one, both or neither of the two blood antigens:

A and B.

- Four main A B O groups:

A, B, AB, O

TYPE A

Surface antigen A



Anti-B antibodies

TYPE B

Surface antigen B



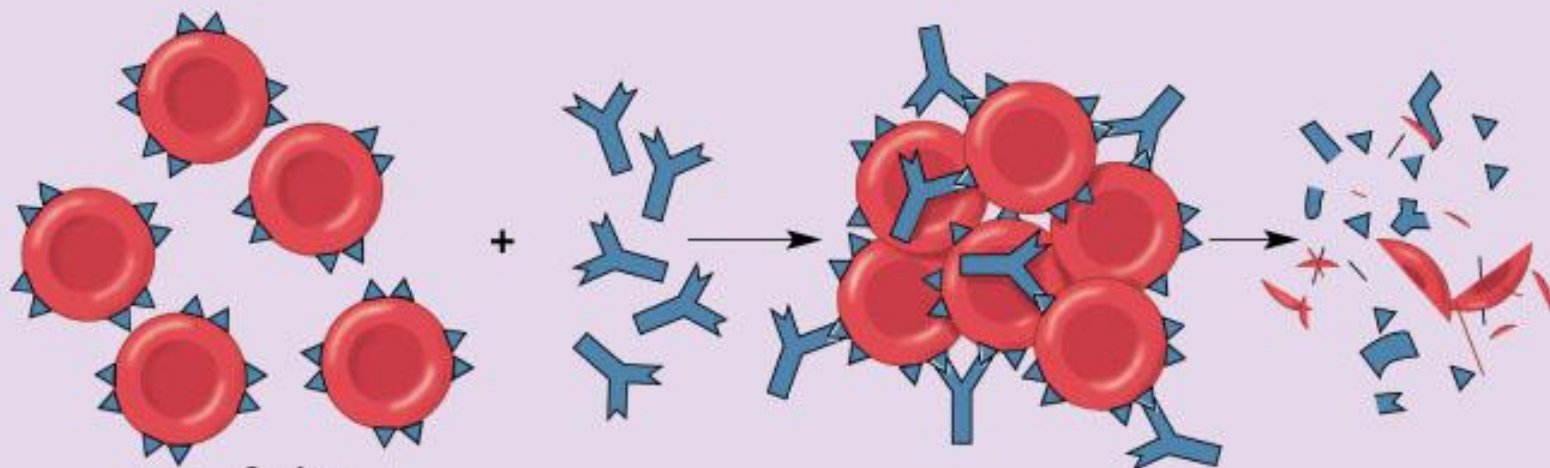
Anti-A antibodies

TYPE AB

Surface antigens A and B

Neither anti-A nor
anti-B antibodies**TYPE O**

Neither A nor B surface antigens

Anti-A and anti-B
antibodies**(a)**Surface
antigens +

+

Opposing antibodies

→

Agglutination (clumping) and hemolysis

(b)

The ABO system- cont.

- Anti-A & Anti-B are:
naturally occurring antibodies.
- Not present at birth, appear 2-8/12
- Triggered by A & B antigens in food
and bacteria

Inheritance of blood groups

Blood group

A

B

O

AB

Genotypes

AA, AO

BB, BO

OO

AB

Note :

AO  A

BO  B

Because O is silent gene .

Uses of genotypes:

- Sorting نزاع disputes in paternal dispute
- Frequency of ABO has ethnic variation
تباين عرقي

Rhesus (Rh) Blood Group

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) -
- Rhesus antigens:
Dd, Cc, Ee
Clinically most important is D

Rhesus (Rh) Blood Group

Anti-D antibody (agglutinin):

- Is not naturally-occurring
- Can be acquired by:
 - i-Transfusion of Rh-ve individual with Rh+ve blood
 - ii-Rh-ve pregnancy with Rh+ve faetus.

Importance of blood groups

1. Blood Transfusion.

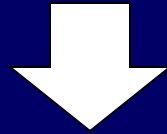
2. Rh incompatibility غير متوافق
between mother and fetus

Blood Transfusion

	D	O	N	O R
Patient	A	B	AB	O
A	-	+	+	-
B	+	-	+	-
AB	(-)	(-)	-	(-)
O	+	+	+	-

Transfusion Reaction

- If a patient of blood group A transfused with blood of group B



- The anti-B in patient's plasma will agglutinate the transfused group B cells

Outcome:

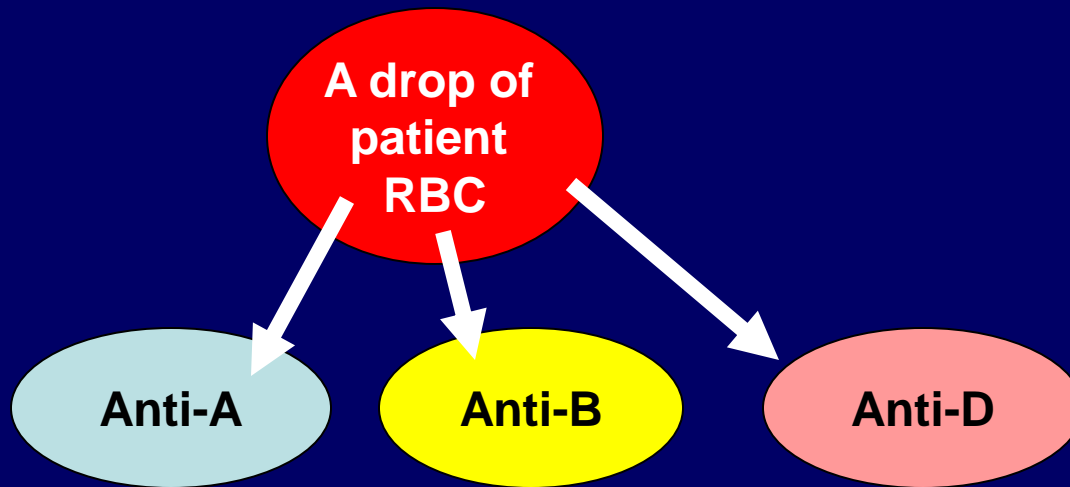
- The clumped cells plug small blood vessels (kidney shut down)
- Sometimes immediate hemolysis

Blood tests before transfusion

1. Blood group type of patient (recipient)
2. Cross-matching هذه الخطوة في الأخير للتأكد فقط

Blood tests before transfusion

1. Blood group type of patient (recipient)



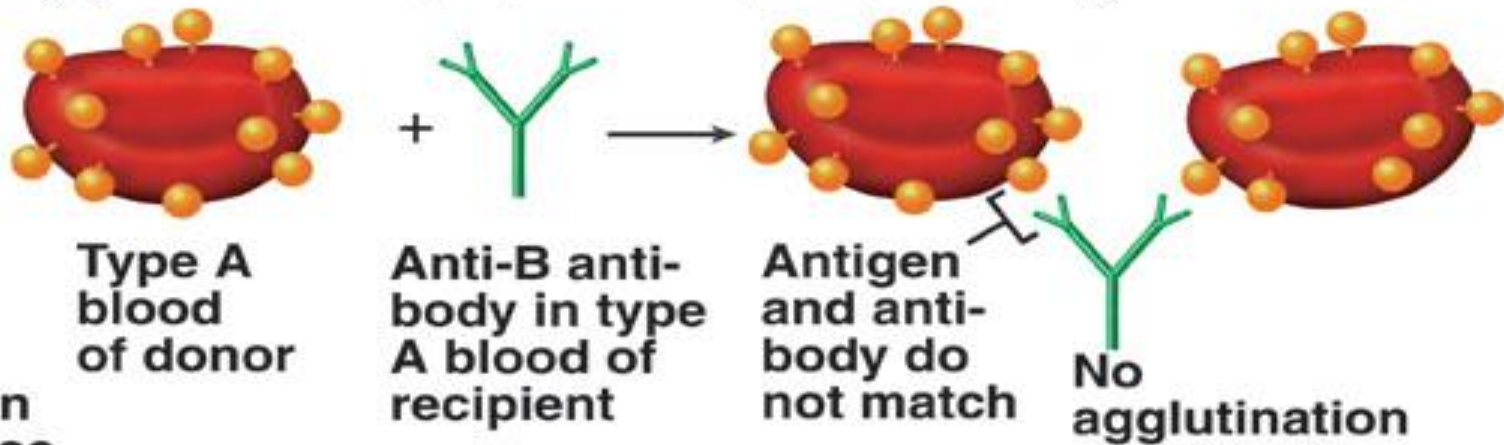
- Look for agglutination

Agglutination Reaction

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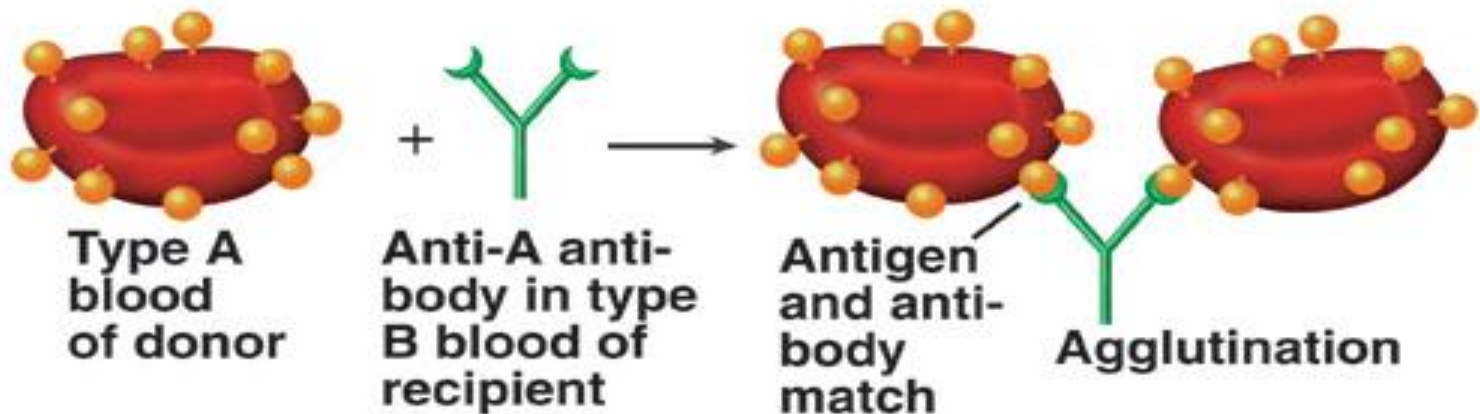
(a) No agglutination reaction. Type A blood donated to a type A recipient does not cause an agglutination reaction because

the anti-B antibodies in the recipient do not combine with the type A antigens on the red blood cells in the donated blood.



(b) Agglutination reaction. Type A blood donated to a type B recipient causes an agglutination reaction because

the anti-A antibodies in the recipient combine with the type A antigens on the red blood cells in the donated blood.



Blood tests before transfusion

RBC	Anti A	Anti-B
O	-	-
A	+	-
B	-	+
AB	+	+

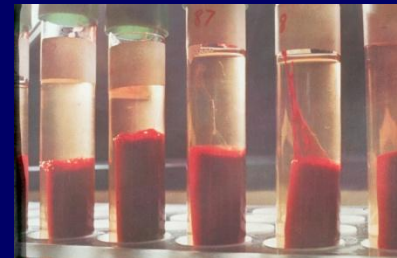
Blood tests before transfusion

2. Cross-matching:

donor cells

+

recipients (patient)
serum



Complications مضاعفات of blood transfusion

1. Immune reactions: **Incompatible blood transfusion: Immediate or delayed reaction, fever, haemolysis, allergic reaction,**
2. Transmission of diseases; malaria, syphilis, viral hepatitis & Aids
3. **Iron Overload.**

Rh incompatibility
between
mother and fetus

- اذا كانت الأم - والإبن الأول + :

- عند الولادة سوف يختلط دم الإبن مع الأم . فيستوجب ذلك على الجهاز المناعي لدى الأم ان يفرز Anti – D الذي يدمر الدم + الذي تركه الإبن وبقى Anti – D موجود في الدم .

- الإبن الثاني :

- إذا كان ايضاً + فسوف يخترق Anti – D المشيمة للإبن ويدمر الدم + لديه ويؤدي إلى Hemolytic Disease

- العلاج :

- تحقن الأم بعد المولود الأول بـ Anti – D

Rh incompatibility between mother and fetus

- Mother Rh-ve first Rh+ve baby:
- **At delivery**
 - Fetal Rh+ RBC cross to maternal blood
- The mother will develop Anti-D after delivery.
- First child escapes & is safe

(If the mother is transfused with Rh+ve blood before, first child will be affected)

Rh incompatibility between mother and fetus-cont.

- Second fetus

- If Rh+ve
- Anti-D crosses placenta and destroys fetal Rh+ RBC
- Outcome?

Hemolytic Disease of the newborn

Hemolytic Disease of the newborn

1. Hemolytic anemia:

- If severe:

treated with exchange transfusion:

Replace baby blood with Rh-ve RBC
(several times)

2. Hydrops fetalis (death in utero)

Hemolytic Disease of the newborn-cont.

Prevention:

- Injecting the mother with anti-D immediately after 1st childbirth
- Antenatal (during pregnancy) prophylaxis