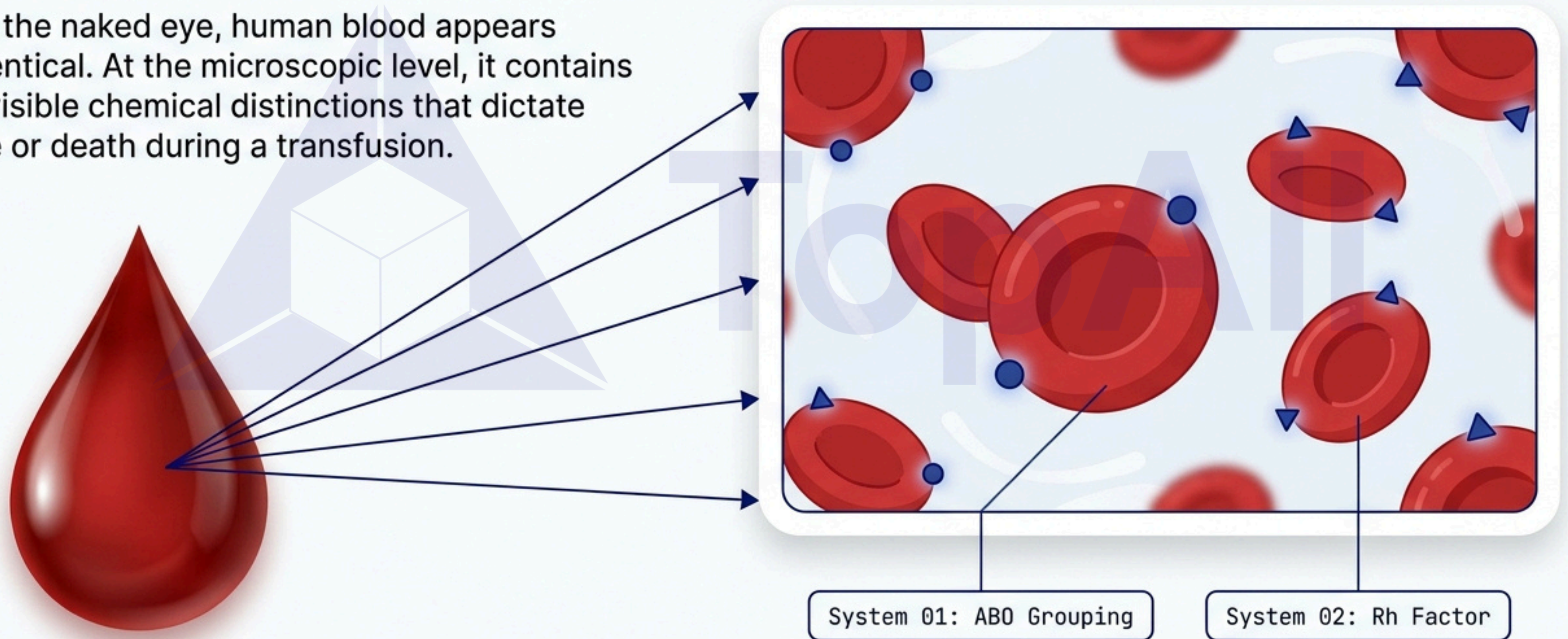
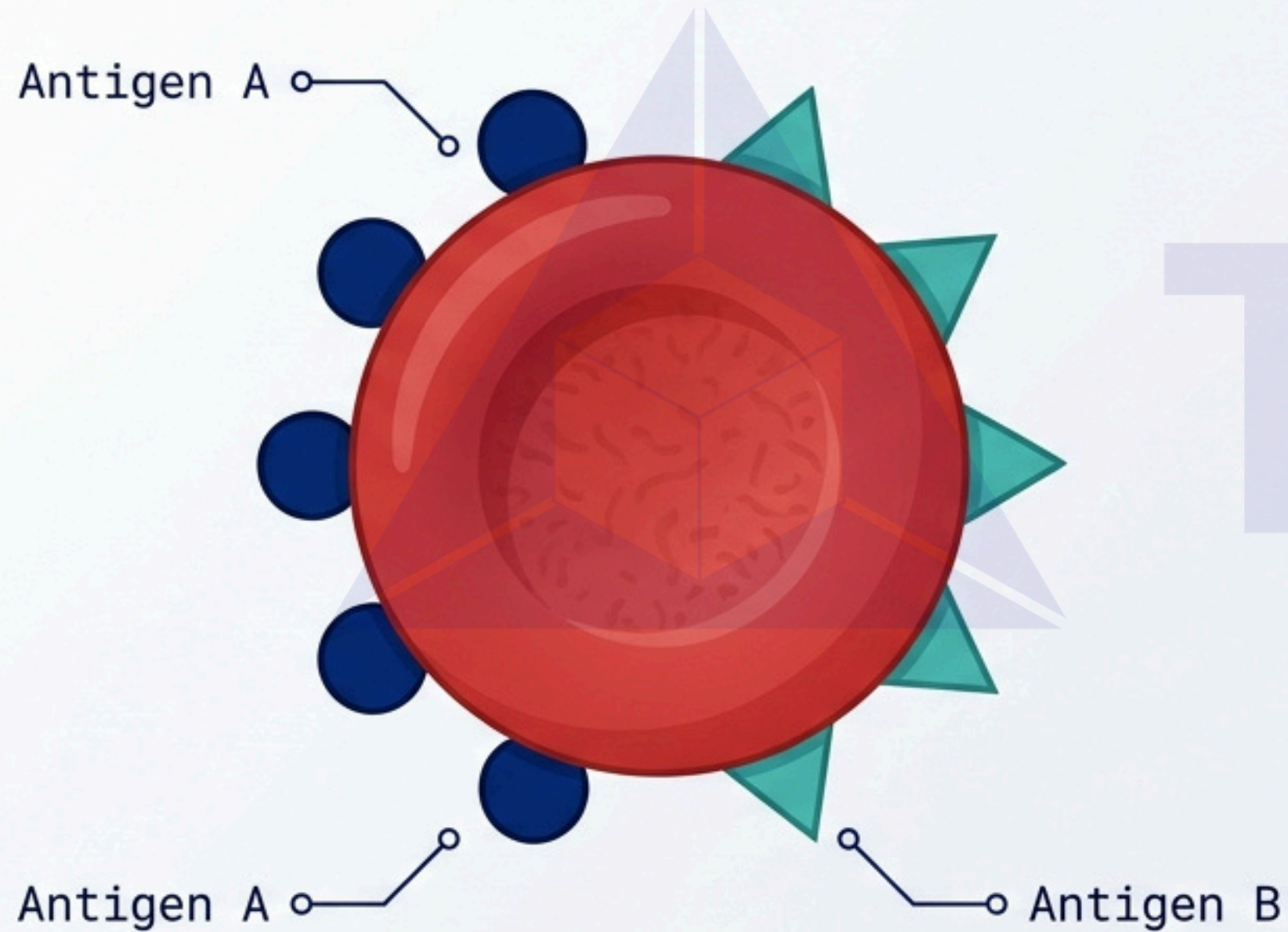


Why Matching Blood Matters

To the naked eye, human blood appears identical. At the microscopic level, it contains invisible chemical distinctions that dictate life or death during a transfusion.



Surface Markers: The Chemical ID Tags



Antigens

Chemical structures present on the surface of RBCs that can induce an immune response.

The ABO System

ABO grouping is based entirely on the presence or absence of two specific surface antigens: Antigen A and Antigen B.

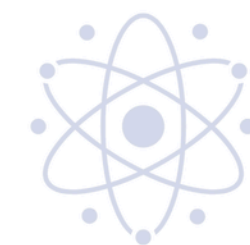
Genetically Inherited

These microscopic tags are inherited and determine a person's fundamental blood type identity.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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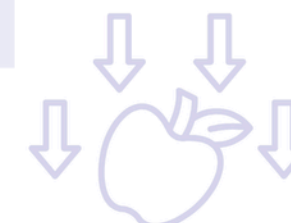
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Key Highlights

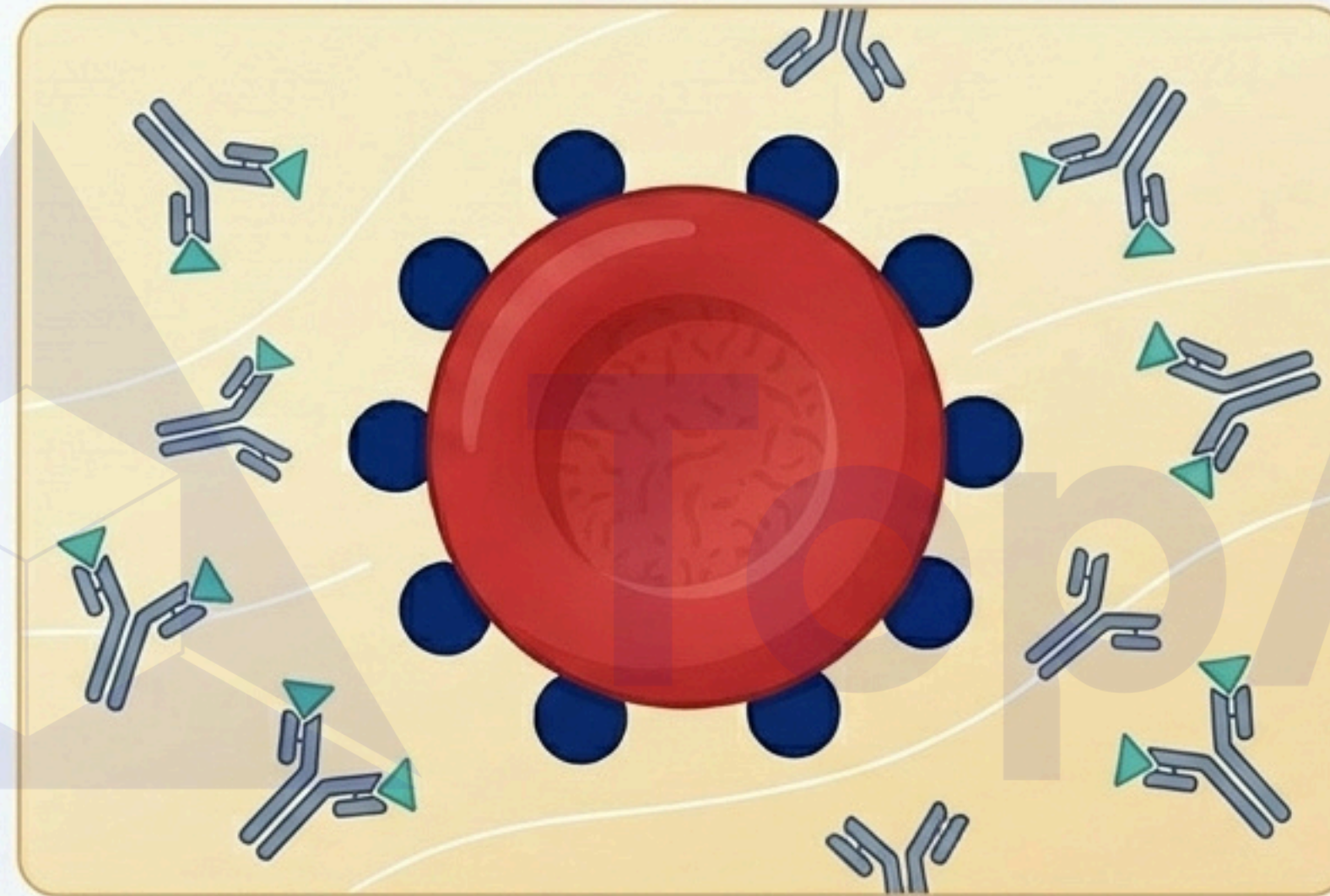
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Plasma Antibodies: The Security System

Antibodies

Natural proteins produced in the blood plasma in response to specific antigens.



The Inverse Rule

The body naturally produces antibodies for whatever antigens it lacks. (e.g., A blood type with Antigen A naturally produces anti-B antibodies).



The Danger of Clumping

If incompatible blood is mixed, plasma antibodies will attack the foreign antigens, causing severe clumping and destruction of RBCs. This is why precise matching is required before transfusion.

The Diagnostic Matrix: ABO Compatibility

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
Group A	A ●	Y anti-B	● A, ○ O
Group B	B ▲	Y anti-A	▲ B, ○ O
Group AB	A, B ● ▲	– nil	AB, ● A, ▲ B, ○ O
Group O	– nil	Y anti-A, B Y	○ O

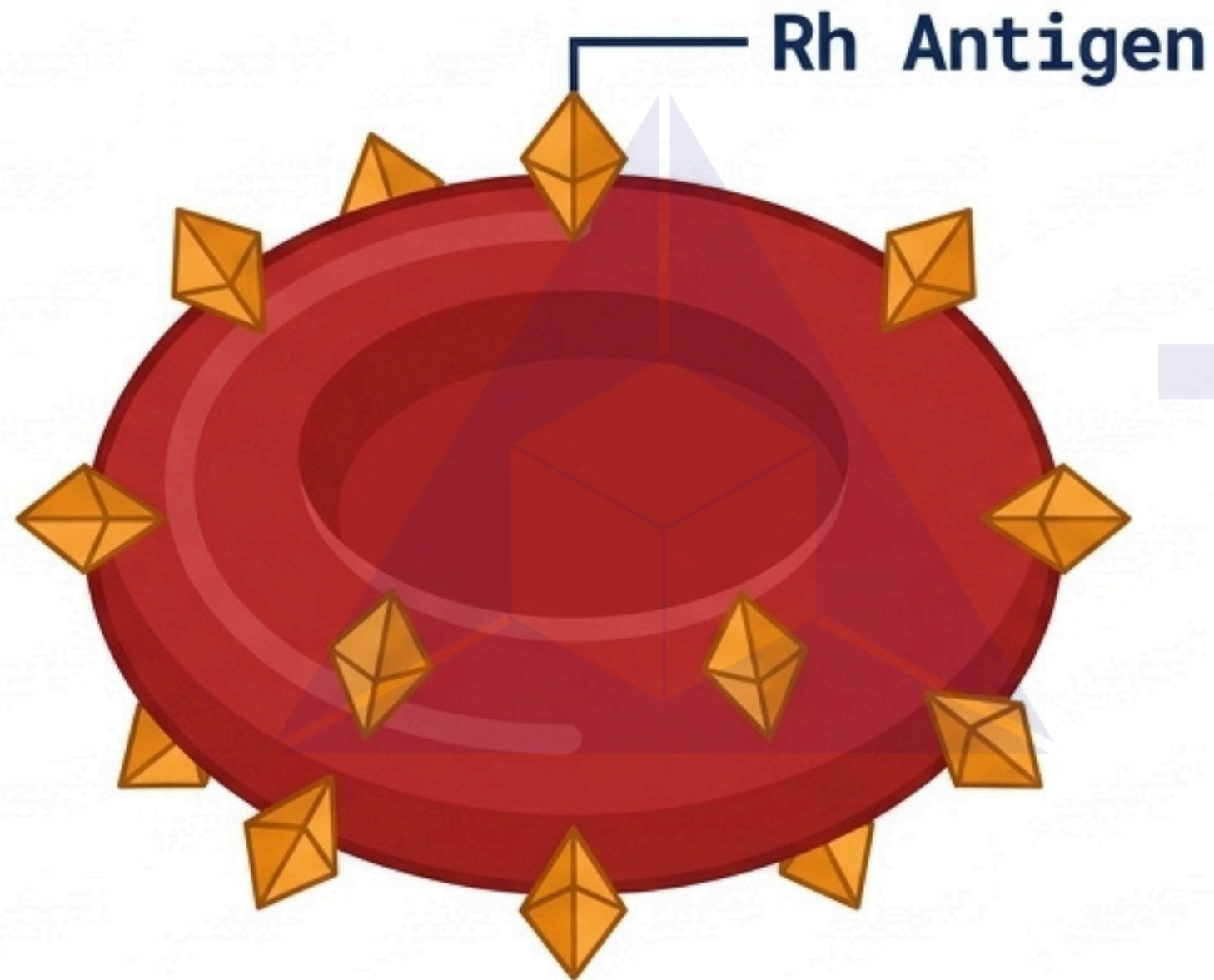
Universal Donor

Group O. Because it has nil antigens, it triggers no immune response and can be safely donated to anyone.

Universal Recipient

Group AB. Because it has nil antibodies, it will not attack any incoming donor blood.

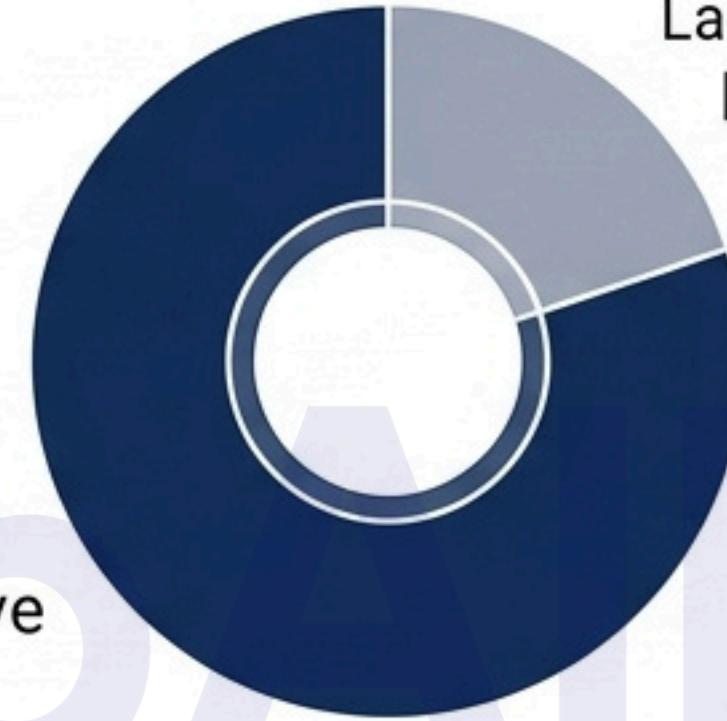
The Rh Factor: A Secondary Surface Marker



Named for its similarity to an antigen found in Rhesus monkeys.

~80%
Rh Positive
(Rh+ve)

Lacking Antigen:
Rh Negative
(Rh-ve)

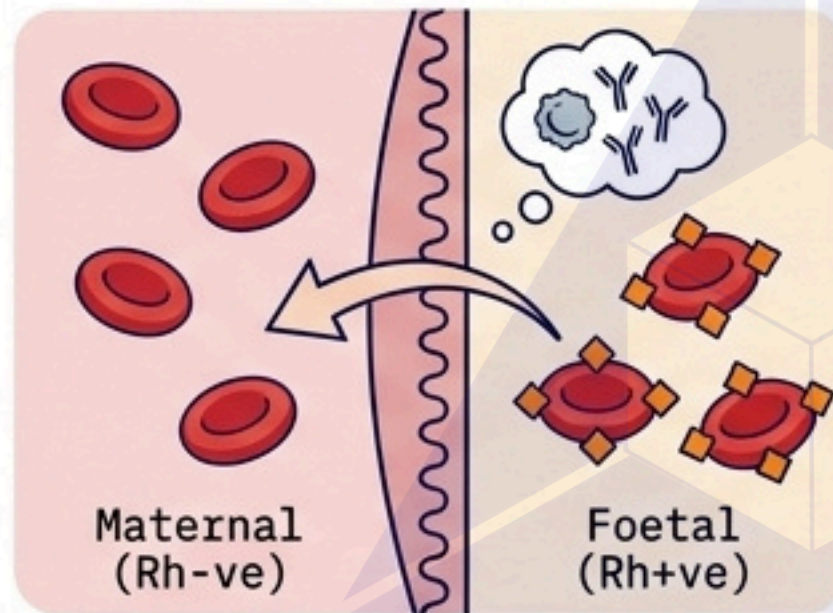


Transfusion Rule

An Rh-ve person exposed to Rh+ve blood will form specific antibodies against the Rh antigens. Therefore, Rh status must always be matched prior to transfusion.

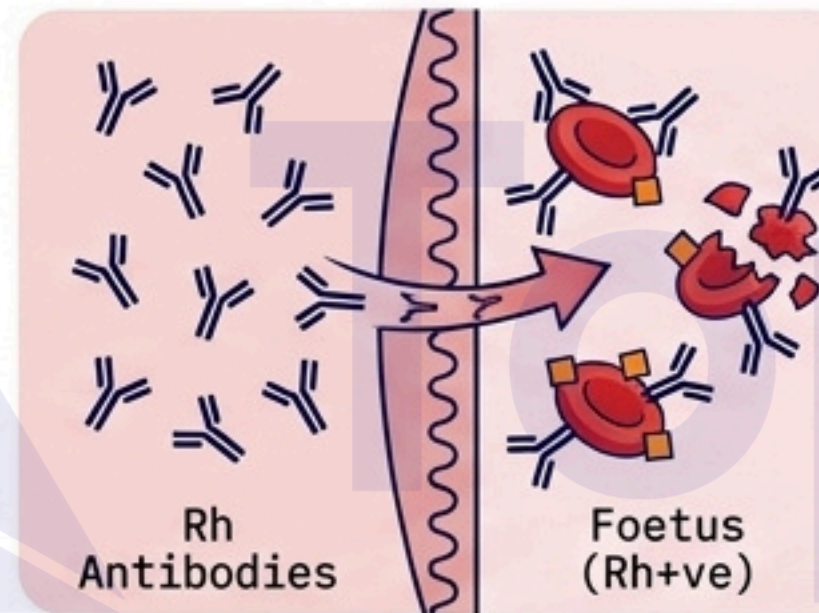
Clinical Consequence: Erythroblastosis Foetalis

Step 1: First Pregnancy



Blood is separated by the placenta. But during delivery, maternal blood may be exposed to foetal Rh+ve blood, causing the mother to start producing Rh antibodies.

Step 2: Subsequent Pregnancy



Erythroblastosis Foetalis

Maternal antibodies leak into foetal blood, destroying foetal RBCs. This can be fatal or cause severe anaemia and jaundice.

Clinical Prevention



This condition is fully preventable by administering anti-Rh antibodies to the mother immediately after the delivery of her first child, neutralizing the threat before her immune system responds.



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