

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

رَبِّ زِدْنِي عِلْمًا

اللَّهُمَّ أَرِنِي حَقِيقَةَ الْأَشْيَاءِ كَمَا هِيَ

“O Allah! Show me the reality of all things as it (really) is..”

BLOOD Physiology

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LECTURER in Physiology

BLOOD GROUPS



Karl Landsteiner

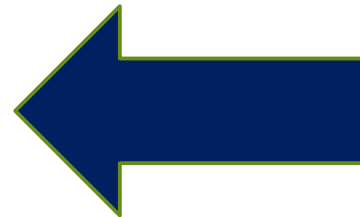
He was an Austrian physician and immunologist.

He distinguished the main blood groups (ABO system) in 1900.



Alexander Solomon Wiener

His pioneer work led to discovery of the Rh factor in 1937



Blood Group Systems

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graph TD; A[Blood Group Systems] --> B[ABO System]; A --> C[Rhesus System (D Antigen)]; A --> D[Kell System];
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ABO System

(most immunogenic antigen)

Rhesus System
(D Antigen)

Kell System

BLOOD GROUPS (ABO System)

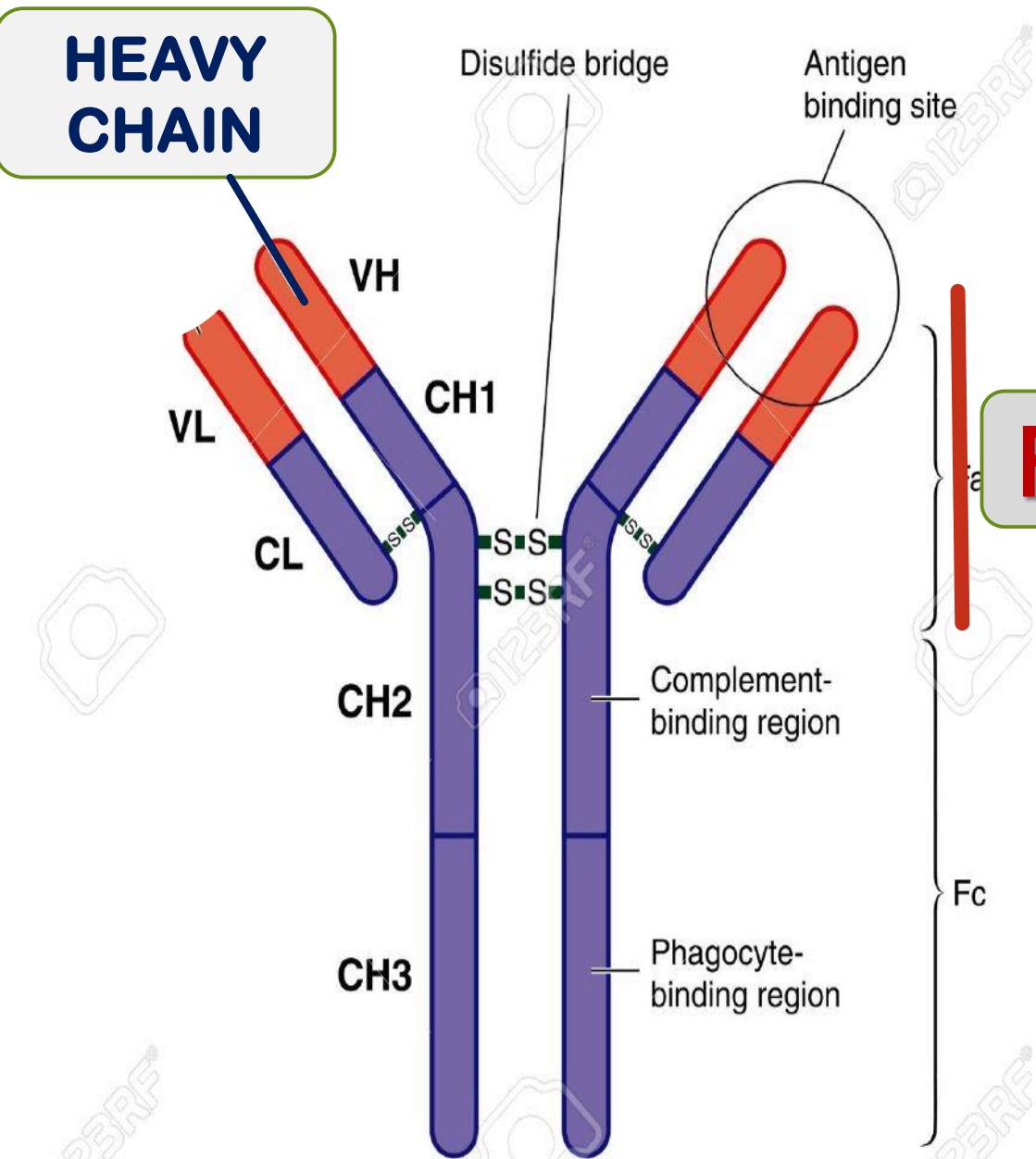
BLOOD GROUP	ANTIGEN	ANTIBODY	GENOTYPE
A	A	Anti-B	AA or AO
B	B	Anti-A	BB or BO
AB	A AND B	NONE	AB
O	NONE	Anti-A & Anti-B	OO

BLOOD GROUPS



- **WHAT IS AN ANTIGEN?**
- **WHAT IS AN ANTIBODY? WHERE IS Ab PRESENT?**
- **How Ab formed in body against antigen not present on RBCs?**

BLOOD GROUPS

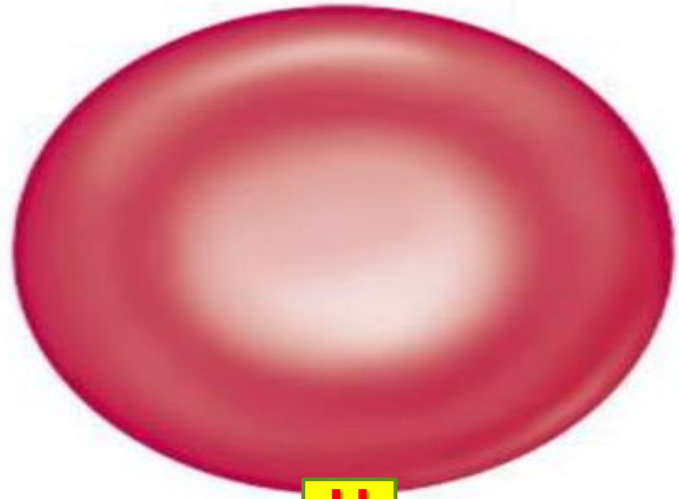


➤ **Antibodies** are immune system-related proteins consisting of **two heavy chains & two light chains**.

➤ The chains join to form a **“Y” shaped molecule**

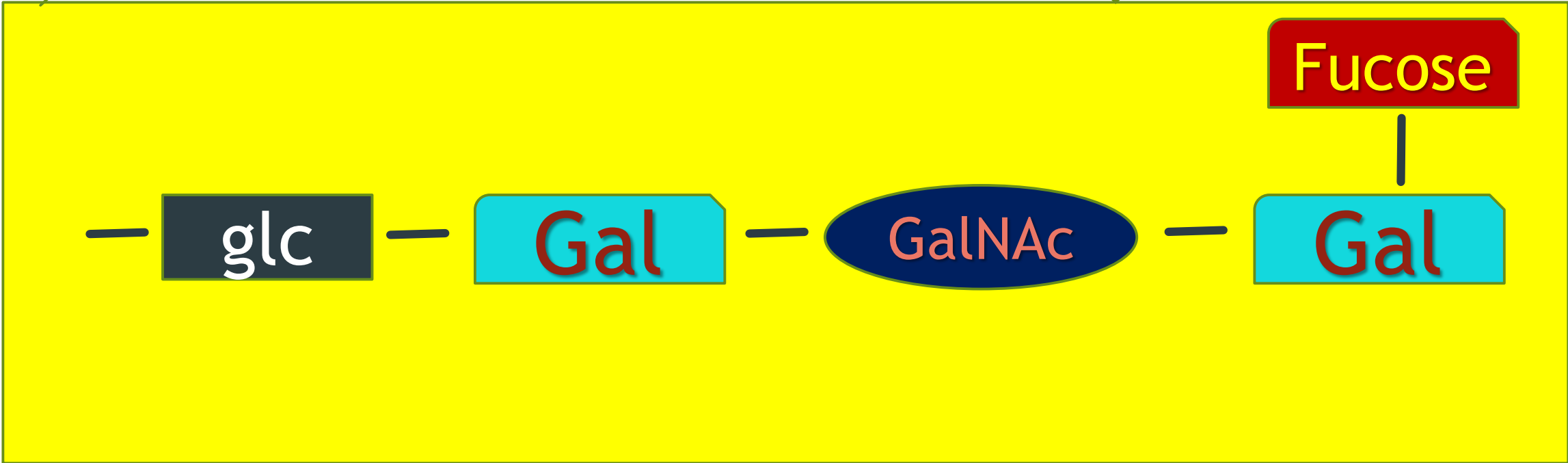
➤ **IgM, IgG, IgA, IgD, and IgE** are five classes

BLOOD GROUPS – H Antigen

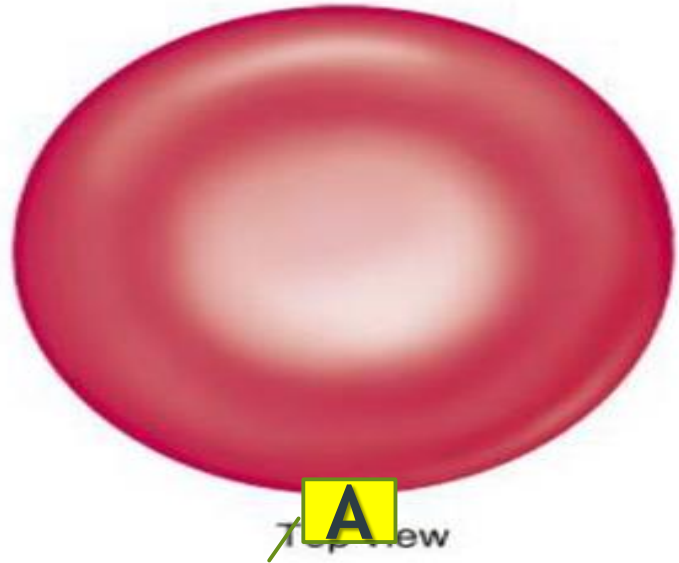


H

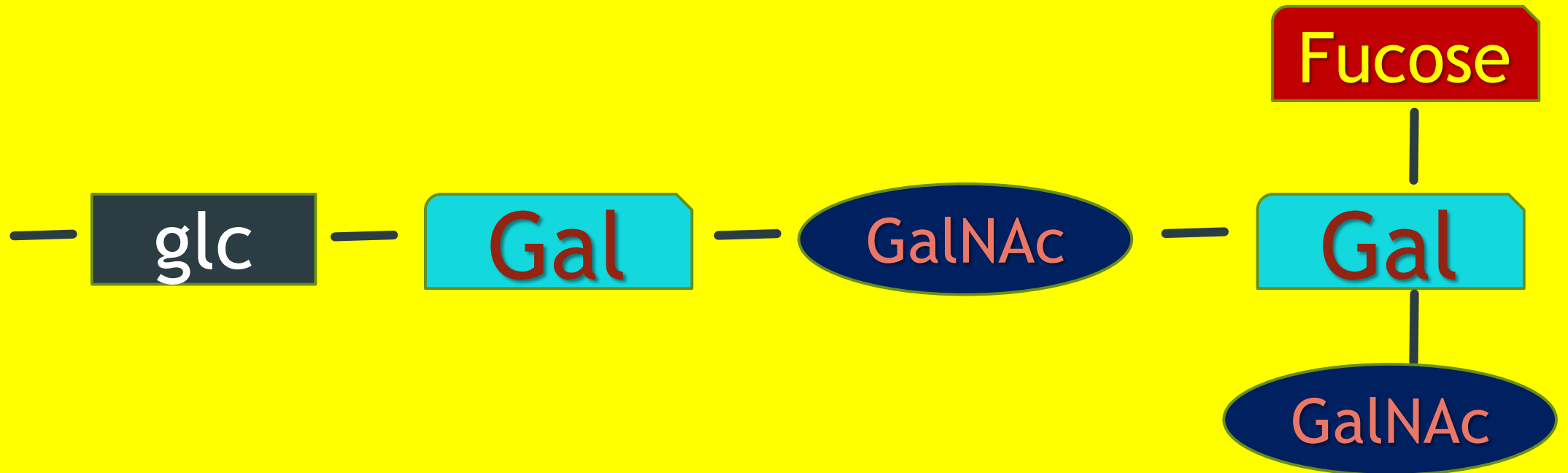
Gal – Galactose
GalNAc - N-AcetylGalactoseAmine
Fucosyl Transefrase
(fucose addition – “H Antigen”)



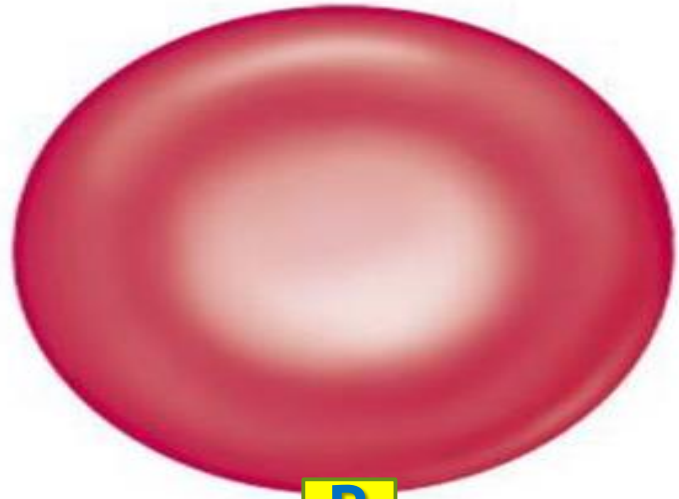
BLOOD GROUPS – A Antigen



Gal – Galactose
GalNAc - N-AcetylGalactoseAmine
Fucosyl Transferase
(Addition of fucose – “H Antigen”)
A – Transferase (adds GalNAc)

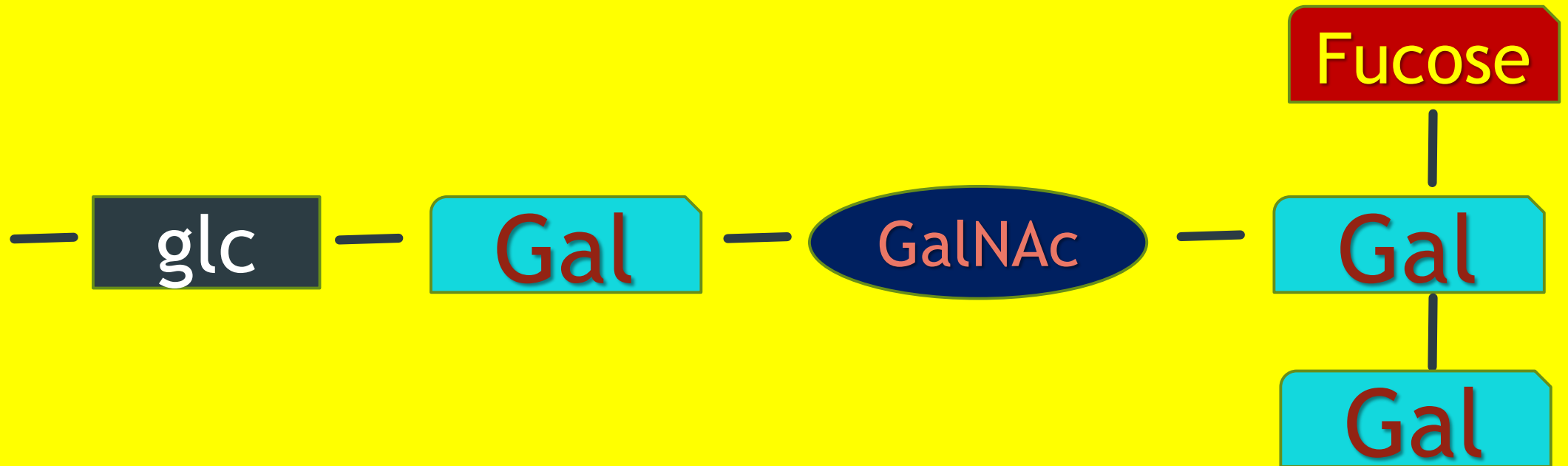


BLOOD GROUPS – B Antigen



B
T. Lew

Gal – Galactose
GalNAc - N-AcetylGalactoseAmine
Fucosyl Transefrase
(Addition of fucose – “H Antigen”)
B – Transferase (adds Gal)



Rh Incompatibility

- ▶ When Rh+ve RBCs exposed to a person whose RBCs are Rh-ve, Anti-rh Abs produced
- ▶ Rh-ve person has now become sensitized to Rh factor

**RH
INCOMPATIBILITY**

Hemolysis

INTRAVASCULAR

EXTRAVASCULAR

Complement Pathways

Classical Pathway
(IC mediated)

C1

Alternative Pathway

C3b

Lectin Pathway

Lectin binds to mannose

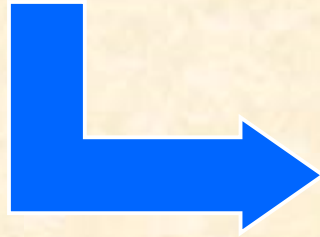
C3
C
O
N
V
E
R
T
A
S
E

C5
C
O
N
V
E
R
T
A
S
E

MAC
(C5b,
C6-9)

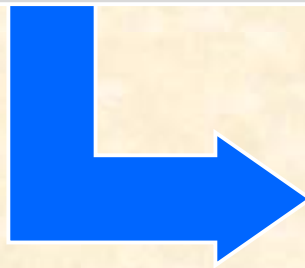
Hemolytic Disease of NewBorn (HDN)

Rh -ve
(mother)
Rh +ve
(Father)



Fetus
(Rh +ve)

- Inherits gene from father



Mother
exposed to
Fetal Blood

- Mother sensitized to the D antigen

Hemolytic Disease of NewBorn (HDN)

- Usually sensitized during 1st Childbirth

Sensitized mother affects subsequent pregnancies

Maternal IgG anti-D enters fetal circulation

- IgG anti-D, transported across the placenta

Hemolysis
Jaundice
Kernicterus

- HDN / Erythroblastosis fetalis

incompatibility - HDN



➤ Treatment?

Exchange Transfusion.

Phototherapy for hyperbilirubinemia

➤ Prevention?

Antenatal prophylaxis with anti-D immunoglobulin in non-sensitized Rh-negative pregnant women at 28 and 34 weeks of gestation (WHO)

Administering anti-D immunoglobulin to Rhnegative women within 72 hours of giving birth to an Rh-positive baby