



### MSK- II MODULE SKILL LAB /Physiology PRACTICAL FIRST YEAR MBBS BATCH 50 DETERMINATION OF RH BLOOD GROUP

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### Motto

### Vision; The Dream/Tomorrow



- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine







#### BLOOM'S TAXONOMY : DOMAINS OF LEARNING

Sr. #	Domain of learning	Abbreviation	Levels of the domain	Meaning
1	cognition	С	C1	Recall / Remembering
2			C2	Understanding
3			C3	Applying / Problem solving
4	Psychomotor	Ρ	P1	Imitation / copying
5			P2	Manipulation / Follows instructions
6			P3	Precision / Can perform accurately
7	Attitude	A	A1	Receiving / Learning
8			A2	Respond / Starts responding to the learned attitude
9			A3	Valuing / starts behaving according to the learned attitude

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## BLOOM'S TAXONOMY OF THE COGNITIVE DOMAIN





#### **LEARNING OBJECTIVES**

Sr. #	Learning Objective	Domain of Learning
1	To describe the relevance of doing RH blood grouping.	C1
2	To perform step by step the RH typing of Blood.	P3
3	To understand the reason of doing RH blood grouping.	C2
4	To explain different RH-Antibodies.	C2
5	To correlate Clinically with hemolytic disease of newborn or erythroblastosis fetalis.	C3
6	To assess the neoborn with jaundice due to erythroblastosis fetalis.	C3



### **Horizontal integration**

Horizontal integration Genetics/biochemistry



### Horizontal integration (Biochemistry)

- > The RH locus is located on the chromosome 1.
- ➢ It contains two closely linked genes RHD and RHCE.
- RH D gene encodes D antigen( transmembrane proteins )
- RHCE gene encodes CE antigens.
- RH antigens are transmembrane proteins with loops exposed at the surface of red blood cells.



**Reference:- Wikipedia image of RH gene** 

Horizontal integration Genetics/biochemistry



## **Horizontal integration**

- Person with the DD or Dd genotype have the RH antigen (D antigen) on their erythrocytes and are termed RH- Positive.
- > person with genotype dd are RH- Negative and do not have the RH antigen.
- Frequency in population RH- Positive 85%, RH- Negative 15%.

Gametes	D	d
5		
d	Dd = Rh Positive	dd = Rh negative
d	Dd = Rh Positive	dd = Rh negative





#### **Reference:- Wikipedia image of RH gene**





### Introduction:-

- Landsteiner and Weiner discovered a different antigen in the cells of the Rhesus monkey in 1940.
- > The Rh factor is found in all body cells, not just on the RBC's.
- Actually there are eight different types of Rh antigens. Out of these, four antigens are stronger and, thus react with anti-Rh (anti D) antiserum.





### Importance of RH Blood Typing:-

RH D antigen is the most immunogenic red cell antigen after A and B antigen.

	CAN DONATE TO	CAN RECIEVE FROM
A+	A+, AB+	A+, A-, O+, O-
A-	A+, A-, AB+, AB-	A-, O-
B+	B+, AB+	B+, B-, O+, O-
В-	B+, B-, AB+, AB-	в-, О-
AB+ (universal recipient)	AB+	ALL GROUPS
AB-	AB+, AB-	A-, B-, AB-, O-
0+	A+, B+, AB+, O+	0+, 0-
O- (universal donor)	ALL GROUPS	0-



### **Procedure:-**

1. Clean and pre-warm a microscope slide on a slide warming box

2. Mix 1 drop of the blood with one drop of anti-Rh (Anti-D), antiserum on the slide.

- 3. Mix the contents with the help of tooth pick and by tilting the slide to confirm through mixing.
- 4. Observe for the Agglutination. Check under the microscope if there is any doubt.
- Agglutination suggests the presence of Rh factor and the blood group is Rh +ve, if no agglutination then the blood group is Rh -ve.





(b)



(c)



(a) Result of A+ (b) Result of B+

(d)

(c) Result of AB+(d) Result of O+



### **Precautions**

- a. Finger should be cleaned properly.
- b. Prick should be moderately deep.
- c. Avoid squeezing of finger and mixing of tissue fluid with the blood.
- d. Check the expiry date of Anti-D anti serum before use.



### Vertical integration



#### Vertical integration pediatrics

### Why Anti- RH Antibodies Are important?

- RH D antibody can cause hemolytic transfusion reactions and <u>hemolytic disease</u> of newborn or erythroblastosis fetalis.
- Anti- RH antibodies of the system are not normally present in the system but can be produced if an individual with RH - is exposed to RH + antigen usually



**Reference:- Google Image RH antibodies** 

#### integration pediatrics HEMOLYTIC DISEASE OF NEWBORN OR

Vertical

### **ERYTHROBLASTOSIS FETALIS:-**

A disease in which the fetus red blood cells have been lysed by mothers antibodies, caused by blood group incompatibility between mother and child. **RH Hemolytic Disease of Newborn :** 

Type of anemia in which the RBCs of a fetus are destroyed by antibodies produced by the mother resulting from a blood group incompatibility between the fetus and its mother.

- This incompatibility arises when the fetus inherits a certain blood factor gene from the father that is absent in the mother.
- RH Incompatibility Results When RH negative mother becomes pregnant with RH. positive child (the child having inherited RHD antigen from the father).
- If the father genotype is DD, all of their children will be RH-Positive. If the father genotype is Dd, half of their children will be RH-Positive.







Vertical

integration

### Hemolytic Disease of Newborn or Erythroblastosis Fetalis:-



### Dediatrics AEMOLYTIC DISEASE OF NEWBORN OR ERYTHROBLASTOSIS FETALIS:-

#### In the First Pregnancy with RH Positive fetus :

RH + antigens from the developing fetus can enter the mothers blood during delivery. After birth or abortion :

The mother will produce anti RH antibodies.

Vertical

#### In next Pregnancy with RH Positive baby :

Mother anti RH antibodies IgG will cross the placenta and damage fetal red blood cells and cause disease called Hemolytic Disease of Newborn.





#### Acute Hemolytic Transfusion Reaction: Signs and Symptoms





### **Biomedical Ethics**



### Law & medicine

Medical matters comes into interaction with law in 4 aspects



1. Legislation and administrative regulation affecting medical practice.

2. Court Judgments on problematic or controversial ethical issue in medicine.

3. Medical matters or personnel may become subjects of law suit when issue of medical malpractice or medical negligence arises.

4. Use of medical matter as evidence in court for other criminal or civil proceedings such as homicide, rape, wounding, work's man compensation, insurance claims etc.



### **MORAL DUTIES OF DOCTOR**

- The duty to help cure
- The duty to promote and protect the patient's health.
- The duty to inform
- The duty to confidentiality
- The duty to protects patients life
- The duty to protect the patient's life
- The duty to respect the patient's autonomy
- The duty to protect privacy
- The duty to respect the patients dignity.



### Codes of Ethics for Laboratory

Testing laboratories have an obligation to adhere to high ethical standards in order to provide with the accurate and reliable test results needed to meet the requirements and reduce uncertainty in results.

- Always wear white coat in lab
- Handle the glassware gently
- Wait for your turn while working in groups
- Use gloves while handling chemicals
- Do not waste reagents or other lab supplies





## **Brain Storming** Question & Answer



### **Clinical Scenario**

A 28-year-old primigravida woman with blood type AB Rh(D) negative gives birth to a female infant at 34 weeks of gestation via emergency cesarean section. The father's blood type is O Rh(D) positive. The mother received an antenatal blood transfusion due to anemia during pregnancy. On the second day of life, the newborn develops jaundice and generalized edema. Laboratory investigations reveal a positive direct Coombs test.





### QUESTIONS

**Question 1**: What is the likely cause of hemolytic disease of the newborn in this scenario?

### Answer:

The likely cause of hemolytic disease of the newborn in this scenario is RH incompatibility between the mother and the baby.



### QUESTIONS

# **Question 2** : Explain the reason for HDN due to RH incompatibility?

### Answer:

The mother's blood type is AB Rh(D) negative, while the father's blood type is O Rh(D) positive. This creates a potential for Rh(D) incompatibility, as the mother may develop Rh(D) antibodies during pregnancy. The positive direct Coombs test indicates the presence of antibodies that are targeting the Rh(D) antigen on the baby's red blood cells. This immune response leads to hemolysis of the fetal red blood cells, resulting in erythroblastosis fetalis.



### QUESTIONS

**Question 3** : How to prevent hemolytic disease of newborn during pregnancy?

### Answer:

RH negative mother is givin injections of anti-RH D antibodies D gamma globulin called (Rhogam) around the 28 th week of pregnancy and again with in 72 hours after the delivery of the RH Positive baby.

This must be done for the first and all subsequent pregnancies. The injected antibodies quickly agglutinate any fetal red blood cells as they enter the mother's blood before they stimulate production of anti- RH antibodies.



### Suggested Research Article



### **Related Research Article**

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0235807

# Hemolytic disease of the fetus and newborn due to Rh(D) incompatibility: A preventable disease that still produces significant morbidity and mortality in children

Valeria Pegoraro, Ducciocompet Urbinati, Gerard H. A. Visser, Gian Carlo Di Renzo, Alvin Zipursky, Brie A. Stotler, Steven L. Spitalnik

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#### Abstract

In the mid-20<sup>th</sup> century, Hemolytic Disease of the Fetus and Newborn, caused by maternal alloimmunization to the Rh(D) blood group antigen expressed by fetal red blood cells (i.e., "Rh disease"), was a major cause of fetal and neonatal morbidity and mortality. However, with the regulatory approval, in 1968, of IgG anti-Rh(D) immunoprophylaxis to prevent maternal sensitization, the prospect of eradicating Rh disease was at hand. Indeed, the combination of antenatal and post-partum immunoprophylaxis is ~99% effective at preventing maternal sensitization to Rh(D). To investigate global compliance with this therapeutic intervention, we used an epidemiological approach to estimate the current annual number of pregnancies worldwide involving an Rh(D)-negative mother and an Rh(D)-positive fetus. The annual number



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- 4. Select your desired Institute.
- 5. A page will appear showing the resources of the institution
- 6. Journals and Researches will appear
- 7. You can find a Journal by clicking on JOURNALS AND DATABASE and enter a keyword to search for your desired journal.

#### Link: https://www.topstudyworld.com/2020/05/access-hec-digitallibrary.html?m=1



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