## **BLOOD GROUPS & TYPES**

## История

19<sup>th</sup> CENTURY Boer War

Massive deaths of people: - Many infections - Severe blood loss Atempts to transfuse blood began. Include confusing results. - Include confusing results.

BLOEMFONTEINS

Others died.

## WHY? WHY? WHY?

- Или все должны умереть
- Или все должны жить.
- В чем это различие?
- Этот вопрос задал себе Карл Ландштейнер.
- Он начал исследование, чтобы найти ответ.

## KARL LANDSTEINER, NOBEL LAUREATE, 1930.



# **KARL LANDSTEINER**

- Wondered about this phenomenon.
- Studied this extensively.
- Discovered Blood Groups and types single handedly.
- Framed the Landsteiner's Law in 1904.
- Continued to research on Blood groups and types till his death in 1943.

## LANDSTEINER'S LAW

 "If an agglutinogen is present in the red cells of a blood, the corresponding agglutinin must be absent from the plasma."
 "If an agglutinogen is absent in the red cells of a blood, the corresponding agglutinin must be

present in it's plasma."

## LANDSTEINER'S LAW: APPLICABILITY

- Первый закон применяется для
- всех групп и типов крови.
- Вторая часть Закона важна, но не всегда верна.
- Это верно для группы крови АВО.
- Rh, M,N и другие группы и типы крови не следуют второго правила закона Ландштейнера.

### **ABO BLOOD GROUPS**

The most common type of blood grouping in use.

### AGGLUTINOGENS

- Синоним = antigens.
- Три agglutinogens локализовано на внешней стороне мембраны эритроцита
- Они обладают антигенными свойствами или антигенными детерминантами = или glycoproteins.
- Кровь групп ABO содержит три типа agglutinogens.

## **AGGLUTINOGENS (Contd)**

• Некоторые люди имеют эритроциты c agglutinogen "A". Другие имеют "В" agglutinogen **Третий тип agglutinogen не является** antigenic и называется "Н" Н не вызывает продукцию antibodies. Люди, имеющие H antigen, относятся к группе крови О.

## A AND B, INDIVIDUALS

- Those having the A agglutinogen on their erythrocytes are called A blood group people.
- Those having the B agglutinogen are called the B blood group people.

## **AB & O INDIVIDUALS**

- Some have both the A and B agglutinogens on their erythrocytes and they are called AB type.
- Others have neither A nor B agglutinogens. They have the non antigenic H on their RBCs and are called O group people.

# AGGLUTININS

- The antibodies to the agglutinogens are called Agglutinins.
- These are present naturally in ABO groups.
- They are always present in the plasma of the individual.

 There are two types of agglutinins in the ABO blood system:
 Anti A or α: Alpha
 Anti B or β: Beta

## **AGGLUTININS (Contd)**

- The A group people have the Beta or anti B agglutinin in their plasma.
- Similarly the B group people have the Alpha or Anti-A agglutinin in their plasma.
- The AB group of people have no agglutinins in their plasma.
- The O group people have both Alpha and Beta types of agglutinins in their plasma.



# AGGLUTINATION

- Agglutination or clumping is seen whenever the respective agglutinogens and agglutinins are mixed.
- Agglutinogen A + Agglutinin Alpha = Agglutination.
- Agglutinogen B + Agglutinin Beta = Agglutination.
- Both agglutinogens + Both antisera = Agglutination.
- No agglutinogens = No agglutination.

#### **UNIVERSAL DONOR & RECEPIENTS**

 The blood group O can be given to any other of the ABO group persons and so is called the "Universal Donor" • The blood group AB persons lack agglutinins and so can receive blood from any of the ABO group persons. So this AB group is called as the "Universal Recipient"







## **DONATIONS...**

- A Blood group person can donate blood to A and AB groups.
- B Blood group person can donate blood to B and AB groups.
- AB Blood group person can donate blood only to AB group.
- O blood group person can donate blood to O, A, B and AB groups.



### **PERCENTAGE OF BLOOD GROUPS**



### **PERCENTAGE OF BLOOD GROUPS**



# **Rh TYPING: INTRODUCTION**

- It is the second most important typing of blood.
  These blood groups were originally discovered in Rhesus monkeys
  Rh is another type of agglutinogen.
  It is also present on the outer
  - surface of the erythrocytes.

## **Rh Positive and Negative people**

- People who have the Rh agglutinogen on their RBC membranes are called Rh Positive.
- Those who do not have the Rh agglutinogen are called Rh Negative people.
- Rh-ve people do not NATURALLY carry the corresponding Anti-Rh antibody.

# **DISTRIBUTION OF Rh TYPES**

#### **CAUCASIAN POPULATION**

15



# **DISTRIBUTION OF Rh TYPES**





- Anti-D agglutinins or antibodies do not occur naturally.
- They are produced by the Immune systems as and when it is exposed to the D antigens.
- So these Anti D agglutinins are found only in some of the Rh Negative people.
- Those who have been exposed to the Rh or D antigen

## **Exposure to Antigens: How?**

- The Rh+ve people will never manufacture Anti D antibodies.
- Only Rh ve individuals can develop these Agglutinins.
- When these Rh-ve people receive Rh+ve blood by mistake, they get exposed to the antigen.

• Then they will develop the antibody.

## **Exposure to Antigens: How?**

• In case of an Rh-ve woman, if she is married to an Rh+ve man, she can conceive an Rh+ve child. In this case, the D antigen present on the erythrocytes of the fetus does not go into the maternal circulation throughout the pregnancy (due to the **Feto-Placental barrier)** 

# **Exposure to Antigens: How?**

 During the delivery of the baby, some blood of the fetus spills over into the maternal circulation. The maternal circulation is exposed to the D antigens from the fetal erythrocytes. The maternal circulation slowly develops Anti D antibodies. The first child is however spared.