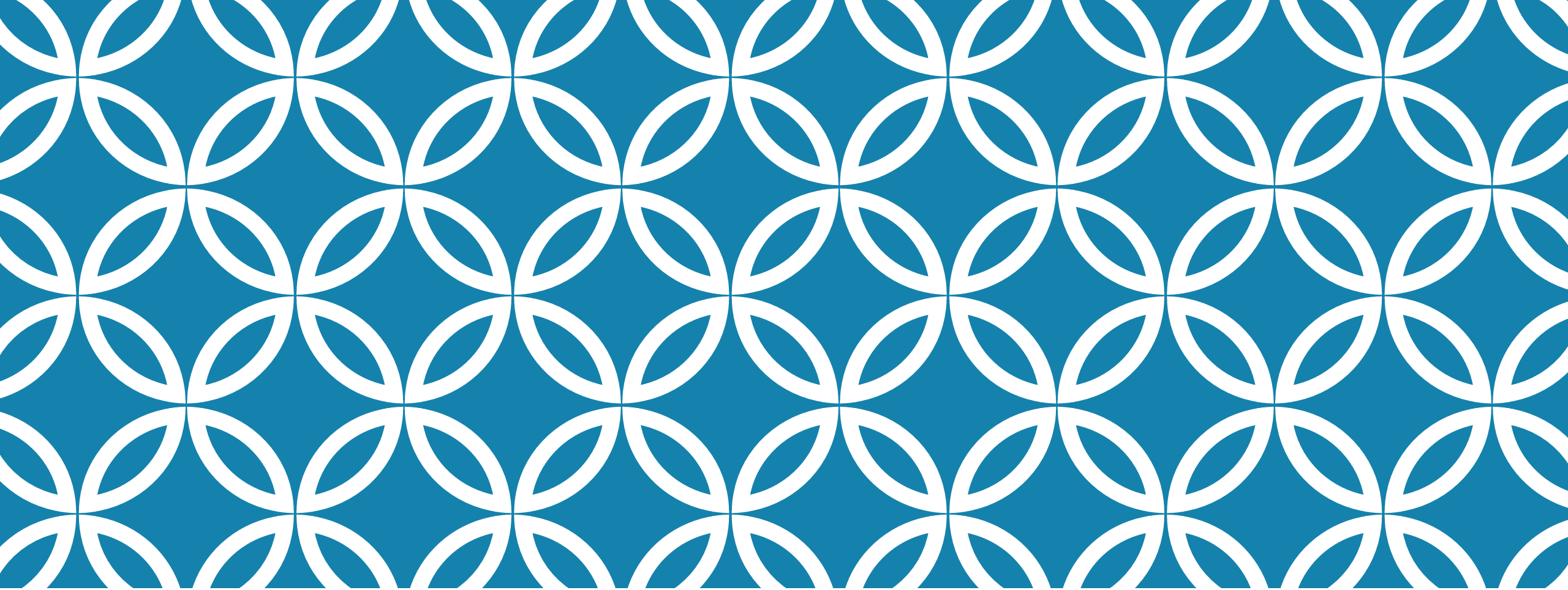


INTRODUCTION TO BLOOD TRANSFUSION AS A SERVICE

BY PROF. MWANDA

LEARNING POINTS

The Organizational structure

Functions of the service

Types of blood donors

Activities of regional blood door centers

INTRODUCTION

Blood transfusion practice is unique in the provision of medical services

The service has to involve virtually every aspect of medical service and roles of the society in health services

Its organizational structure should provide for an all inclusive scientific , medical and societal involvement

The functional structural organization consists of the National Blood Transfusion Center (NBTC), Regional Blood transfusion Centre (RBTC), Blood Banks (BBs) & the Blood Transfusion Units.

Therefore:

- NBTC (Policy formation) -> RBTCs (Donor) -> BBs (Processing) -> BTUs (Compatibility)

THE NBTC

The NBTC has the following policies

- **Policies on blood donation:** it shall be voluntary and non-remunerated
- **Policies on blood handling:** Blood shall be handled in designated containers by designated persons in a designated area; **whole blood** shall be:
  - Kept between 4 and 8°C
  - The anticoagulant of choice is **sodium citrate** (If in the above 2 conditions, it can last for 21 das)
  - If **dextrose** is added it can last for 28 days
  - If **phosphate & adenine 1** is added it can last for 35 days. This is the maximum time whole blood can last.
- No blood shall be transfused unless tested for the following infectious conditions and found negative:
  - Syphilis
  - Hepatitis B & C
  - HIV 1 & 2
- Any person receiving whole blood or red cells must in addition be considered for malaria infection and be treated as such
- The extremes of age and the immunosuppressed must be considered and excluded for other infectious organisms

CONT.

- **Policies on blood utilization:** Donor blood shall be utilized to save life; (in Kenya).

Characteristics of one who is to be a blood donor:

- Must be otherwise healthy
- Must not weigh less than 50
- One can donate a maximum of 3 times a year
- Must be between 16-65 years of age

The NBTC also coordinates the activities of the RBTCs, BBs & BTUs as well as the local, national, international & regional of blood donation and transfusion activities.

THE RBTCS

In Kenya there are 6 in number: Mombasa, Embu, Nairobi, Nakuru, Eldoret & Kisumu

Their main function is in the blood donor systems which:

- Get the blood donors by popularizing blood donation activities
- Examine the blood donors with regard to age, weight and other requirements
- They obtain the blood in the requisite special way
- Transport the donated blood to the blood bank
- They retain and maintain the donor register that has got special functions like finding out those with special blood groups.

It has to be built in a centralized, easily-accessible place.

BBS

Receive the blood, store, process and dispense it.

BTUS

They are the clinical arm whose main function is to link the donor to the recipient/patient.

The procedure for this function involves doing compatibility tests with regards to blood donation and blood recipient which entails:

- Antenatal care
- Postnatal care
- Incase of an untoward event after receiving blood

The components of compatibility tests include:

- Blood grouping
- Antibody screening
- Cross matching

CONT.

In these tests, the principle used is that

- the blood antigens and antibodies of the recipients and the donor must be characterized (coming up with a blood group system, which are 26 in number; only 2 (Rhesus D system & ABO system)a are however considered and only the ABO system in full)

Rules in compatibility:

- One must never give an antigen to an antibody; antibody screening is done in the recipient using the antiglobulin/Coomb's test
  - Direct – antibodies attach to the RBCs
  - Indirect – antibodies are being looked for in the serum

Microscopic evidence of an antigen and antibody reaction:

- Agglutination
- Hemolysis
- Both agglutination & hemolysis

Physical conditions necessary:

- Centrifugation
- Stirring/agitation
- Precipitation

CONT.

Chemical conditions like Enzymes and biological ones like albumin could be provided for the reaction to take place; temperature and pH should be optimum to provide the setting in which certain antibodies and antigens will react. When no reaction occurs, the blood is declared compatible

In cross matching, the red cells of the donor and serum of the recipient are put together in the above conditions in normal saline.

LABORATORY ASPECTS OF BLOOD TRANSFUSION

BY DR. PETER MWAMBA

OBJECTIVES

Define blood groups and state their significance

Discuss the ABO and Rh blood groups

State other blood groups causing transfusion

Explain compatibility testing

HISTORY AND DISCOVERY OF BLOOD GROUPS

1900 – ABO by Landsteiner

1914-1917 – Methods developed to store and transfuse blood

WWI – First large scale transfusions based on serologic identification

BLOOD GROUPS

Inherited carbohydrates and proteins located on the outer cell surface

May be found on other cells or in soluble form in plasma

BGs are either CHOs or proteins

Inheritance of these BGs is determined by genes found at specific sites (loci) on a chromosome

- E.g. ABO genes are located on chromosome 9

Blood group antigens are defined by a specific antibody

TERMINOLOGY

ISBT has categorized BG antigens into various systems with assigned numbers, gene designation, antigens etc.

- E.g. ABO (ISBT No. 001); Rh (ISBT No. 004) etc.

Frequency of various BGs varies between different populations

About 29 blood groups are characterized

BLOOD GROUP SYSTEMS

Major: ABO & Rhesus

Others: MNS, P, Lutheran, Kell, Lewis, Duffy, Kid

Minor: Diego, Yt, Xg, Shanna, Dombrock, Cotton, Landsteiner/Wiener, H, Kx, Gerbich, Cromer, Knops, Kidian, Ok, RAPH, JMH, Globoside, Gil etc.

BLOOD GROUP INHERITANCE

BG genes passed from parents to offspring

One gene/allelic pair derived from each parent

BG antigen in child must be present in at least one parent

Blood groups remain for life

ABO BLOOD GROUP SYSTEMS

ABO is the most important in transfusion medicine

Inheritance is in the Mendelian manner

ABO locus encodes specific enzymes that synthesize A & B antigens on RBCs from a precursor substance (H)

A precursors substance H is converted to A or B substance under the action of the enzyme coded for by the corresponding gene

Detectable at 5-6 weeks of life

Maximum levels 3-4 years

Usually remain unaltered throughout life

Blood group O lacks the A & B antigens but has the H antigen

ABO BLOOD GROUPS

BLOOD GROUP	GENOTYPE
A	AA OR AO
B	BB OR BO
AB	AB
O	O

BLOOD GROUP ANTIBODIES

Antibodies formed in the sera of an individual who lacks the corresponding antigen

Naturally occurring antibodies

- Become detectable at 4 months age
- IgM subtype

Immune antibodies arise through:

- Transfusion or injection of incompatible blood
- Pregnancy
- Injection of A or B substances found in some vaccines
- IgG subtype

RH BLOOD GROUP SYSTEM

Second to ABO in importance in transfusion medicine

Rh gene on chromosome 1

Most complex system> 50 antigens

5 major Rh antigens; D, C, E, c, e

RhD antigen most important clinically

He RHD gene is dominant

- RhD positive whenever this gene is present

RH ANTIGENS

Majority of individuals are Rh D+

- Kenya approximately 2.5-4 are RhD negative

Significant role in the hemolytic disease of the newborn (HDN)

Weak D: Fewer antigenic sites on the red cell Donors should be tested for weak D if test D is negative

- Weak D may be a result of the D having less epitopes

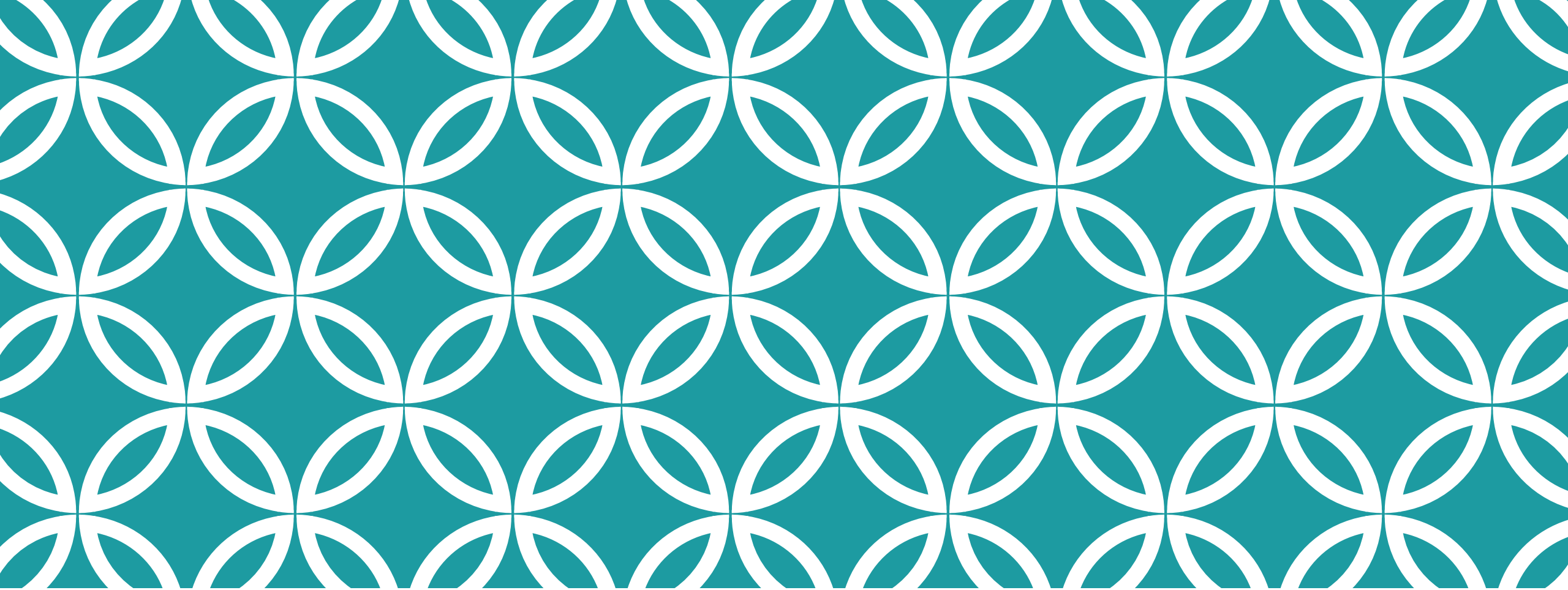
O positive is the commonest blood group in Kenya followed by A+, B+, AB+, O-, A-, B-, AB- in that order.

OTHER BLOOD GROUPS

May be associated with severe or delayed transfusion reactions; HDN; other medical importance (forensic medicine, anthropologic studies, paternity testing, transplant medicine)

MNS blood group system: M, N, S, s

Kell Duffy; Lewis blood group systems



COMPATIBILITY TESTING

BY DR. PETER. M

INTRODUCTION

Majority of life-threatening hemolytic reactions (ABO incompatibility) are caused by errors occurring outside the lab

Staff handling blood transfusion need to be appropriately trained

WHAT IS COMPATIBILITY TESTING?

It is done to ensure that the recipient's immune system does not attack the donor red cells

Includes:

- ABO and RhD typing of the patient & donor
- Antibody screening
- Cross-matching

ANTIBODY SCREENING

Performed on patient's blood

For detection of unexpected potential significant antibody to RBC antigens

- Antibodies associated with hemolysis (HTR) e.g. in hemolytic disease of the newborn

Any antibodies detected are identified to assist in selection of suitable blood

CROSSMATCHING

This is serological testing between a patient's serum and the donor's cells to detect incompatibility

Recommended for all transfusions

Detects ABO incompatibility and clinically significant antibody

It is done by mixing a sample of the patient's serum/plasma with a sample of the donor's red cells

Use of anti-human globulin regent (Coomb's reagent) assists in detection of incompatibility

Look for cold antibodies, warm antibodies, IgM antibodies, complete antibodies & incomplete antibodies.

CONCLUSION

Knowledge of blood groups is important in transfusion and transplantation medicine

BGs are antigens on the RBC outer surface

ABO & Rh systems are the most important clinically

Compatibility testing aids in ensuring that the recipient's immune system does not attack the donor red cells.

END