CV

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- **MD (Transfusion Medicine) , SGPGI -1991-94**
- **Sr Residency 1994 – 97**
- **Faculty – Since 2000**
- **Princess of Wale fellowship**
- **Areas of interest – Immunohematology, clinical Transfusion issues, Patient blood management, Transfusion in Transplatnation, Platelet Transfusion, HDN, neonatal transfusion**

Back to basics of Immunohematology

Reality and expectations in India

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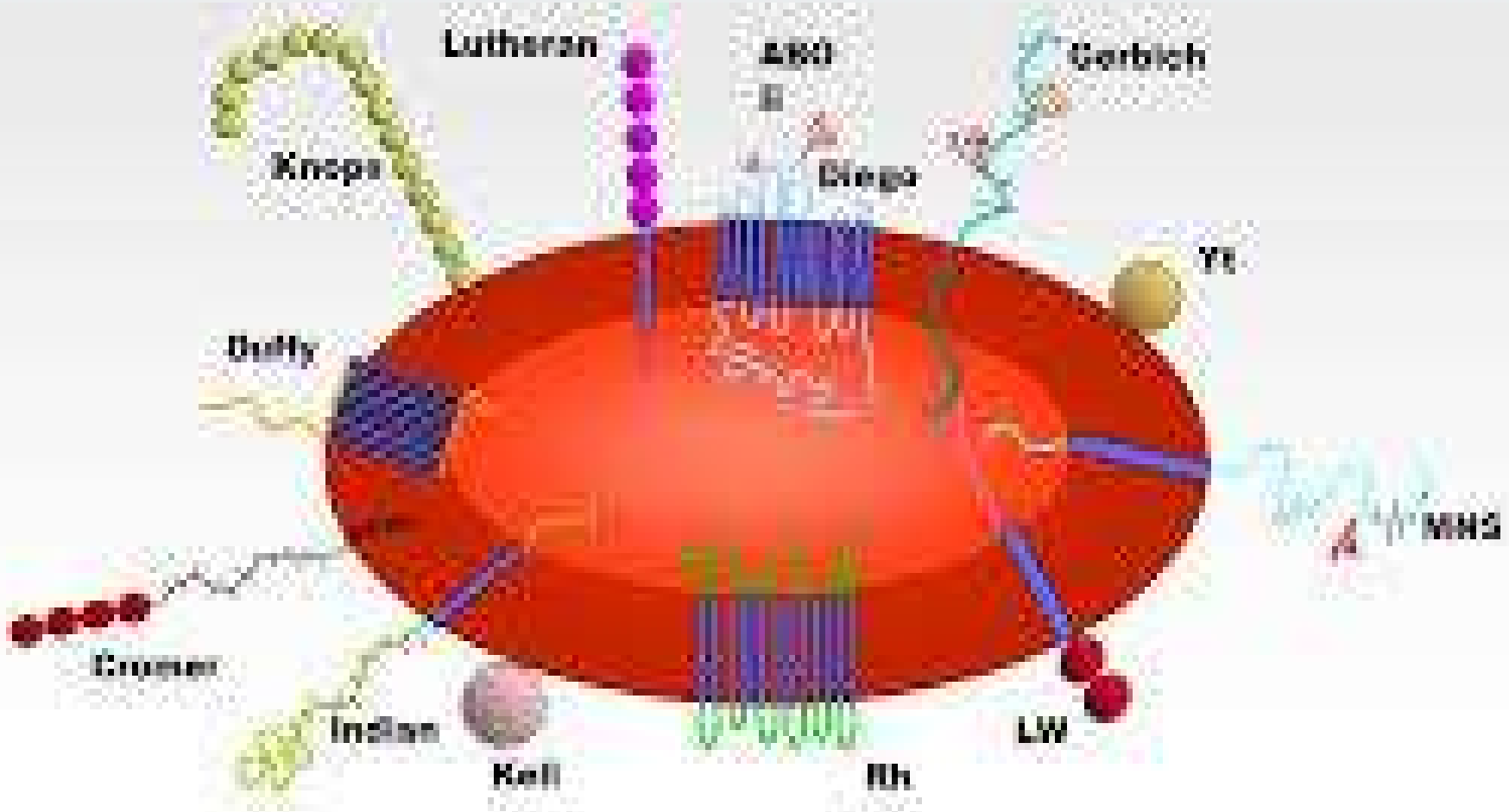
Blood groups on the RBC



The Basics

- RBCs, WBCs and Platelets contain myriad of antigens which can immunise a person if they do not have these antigens, through transfusion or pregnancy -- Alloantibodies
- Sometimes a person can form antibodies against antigens on their own cells – Autoantibodies
- In ABO blood group system there is a presence of reciprocal antibodies
- In some other blood group systems also there are naturally occurring alloantibodies
- ABO and some other antigens are also present on Platelets &Tissues.

The Basics

In vivo

- RBC antigen antibody reactions can cause hemolysis HTRs, HDN, AIHA or agglutination – Cold agglutinin syndromes
- Platelet antigen antibody reactions can cause – Refractoriness or Purpura d/t destruction of platelets i.e. In NAIT, ITP, PTP or HIT
- Neutrophil antigens of which
  - HLA are tissue antigens can be a - cause a transplant rejection hence matching is necessary, can result in platelet refratoriness
  - HNA and HLA antigen –Antibody reactions are can cause FNHTR
- Also important in understanding and management of GvHD , Major and Minor ABO incompatible transplants

Immnohematology

- Study of blood cell antigens and antibodies and their interactions
- Antigens - Structure, Inheritance, Phenotypes, Genotypes, Function, their frequencies & how to detect them
- Antibodies – Allo/auto, Immune/naturally occurring, clinical importance, In vivo coated on cells or in plasma, Quantitation and how to detect

Glimpses of development

- Immunohematology, the backbone & important sub speciality of Transfusion Medicine
- Discovery of ABO blood group system in 1901 by Lansteiner– Landmark step
- Another Giant stride - Discovery of Rh (D) & Coombs test in 1940s
- Discovery of plethora of RBC antigen systems & their clinical implications i.e. HDN, HTR, AIHA etc.

Glimpses of development

- Parallel development of Techniques, reagents and platforms/ eqiupment to detect RBC antigen antibody reactions i.e. Hemagglutination
- Development in field of HLA, Granulocyte & platelet serology
- Latest tool in armentarium – Molecular blood grouping.
- Universal blood
- Kodecytes
- International organisations – AABB, ISBT, BBTS, ARC, WHO
- Publications – Journal - Immunohematology

RBC serology – the scope

- Blood grouping – ABO, Rh phenotyping, extended phenotype –
  - Blood group antigen frequencies – as genetic markers – Inheritance, Racial & disease associations & modification, paternity testing,
  - Weak groups, subgroups
  - Structure of RBC antigens
  - Quantification of antigens
  - Modification of antigens- Universal RBCs - ECO RBCs, Stealth RBC
  - Importance with regards to Transfusion, Transplantation
- RBC antibodies – Factors affecting alloimmunization , characteristics, clinical implications
- Invitro tests to detect the red cell antigens, antibodies & antigen – antibody reactions.
- Reagents – RBC antigen typing Antisera / Red cell antibody identification panels, enhancers,
- Platforms for high through put testing.
- Techniques – Adsorbtion/elution

Development of Immunohematology in India

- 1942 - First blood bank in Kolkata (IIHPH)
  - Polyclonal reagents, Human plasma
  - Volunteer (RhD Negative males) alloimmunization for anti –D
  - Coombs sera – sheep/ Rabbits
- Indian pharmacopoea -1946
- Tile technique / Only cell grouping.
- Drug & Cosmetic Act 1940
- 1957 – Blood group Reference Center (ICMR) – Mumbai - IIH in 1982 – NIIH in 2008

BGRC

- To train people in methodology of blood grouping and blood banking
- To prepare & supply standard blood grouping reagents
- To work as reference center for unsolved problems of blood grouping & crossmatching
- To prepare & maintain list of rare blood groups
- Conduct research in the field
- Antenatal serology & maternal alloimmunisation

NIIH - Landmark discoveries & activities

- 1952 – Bombay Blood Group, 1961 – ParaBombay Blood Group
- 1973 – In^a Blood Group, 1977 – I-i- phenotype
- Others – D_ _/D _ _ phenotype, Mg antigen, In a+b-, Co (a-b-) & Rh Null
- Intrauterine transfusions at Wadia Maternity Hospital
- Lectins
- Measurement of Anti D concentration –IRMA, ELISA
- ADCC assay for functional assessment of anti D in causing HDN
- Rh D variants
- Use of flowcytometry for anti D quantitation, FMH estimation, RBC bound Ig, Quantitation of D antigenic sites
- Donor population studies for rare blood group registry
- Training of personnel > 4 decades
- Research – Molecular studies, Monoclonal antibodies
- Immunohematology Bulletin

Immunohematology in India – Current Scenario

- Mixed Scenario-
  - Very few research centers
  - Few Academic centers
  - Many transfusion service Centers
  - Laboratories
- Public / Private Enterpises
- Range of services provided varies

Academic programmes

- Traditionally part of MD(Path & Micro), then MD Pathology
- With Rapid growth in field need for full fledged Training program felt –
- For Doctors
    - DIBT
    - MD (Transfusion medcine/ Immunohematology & Blood Transfusion) started in 1990
    - DNB
- For Paramedicals – MSc, Diploma/Degree in MLT, MSc MLT
- Short term trainings – III, workshops by academic societies

Current Scenario

Publications-

- Antigen frequencies
- Weak antigens, subgroups
- Use of flowcytometry
- RBC Antibodies as a cause of HDN, HTR
- Autoimmune Hemolytic anemia
- Management of ABOi transplants
- Solving complex antibody cases and providing compatible blood
- New blood group antigen discovery - INRA (IN05)

Reagents

- Very few Indian manufacturers
- Prior to 1957 – Blood banks made ABO grouping antisera on their own – Polyclonal, Human source, batch to batch variation
- !957 onwards- BGRC, Standards for blood grouping reagents
- 1974 onwards – Haffkine Institute, Other manufacturers
- Lectins
- Monoclonal reagents – Murine, Human, WHO standards, Blends
- Role of NIB

Technology

- Slide/ Tube techniques
- Semi automated and fully automated platforms
  - Microplate techniques
  - Column agglutination technology
  - Erythrocyte magnetised Technology
  - Solid Phase Red cell Adherence assays

Granulocye and Platelet Serology

- HLA antigen and antibody detection methods
- Granulocyte ag-ab detection
- Platelet antigen & antibodies – Alloimmunisation, refractoriness, NAIT, PTP

Molecular Blood Grouping

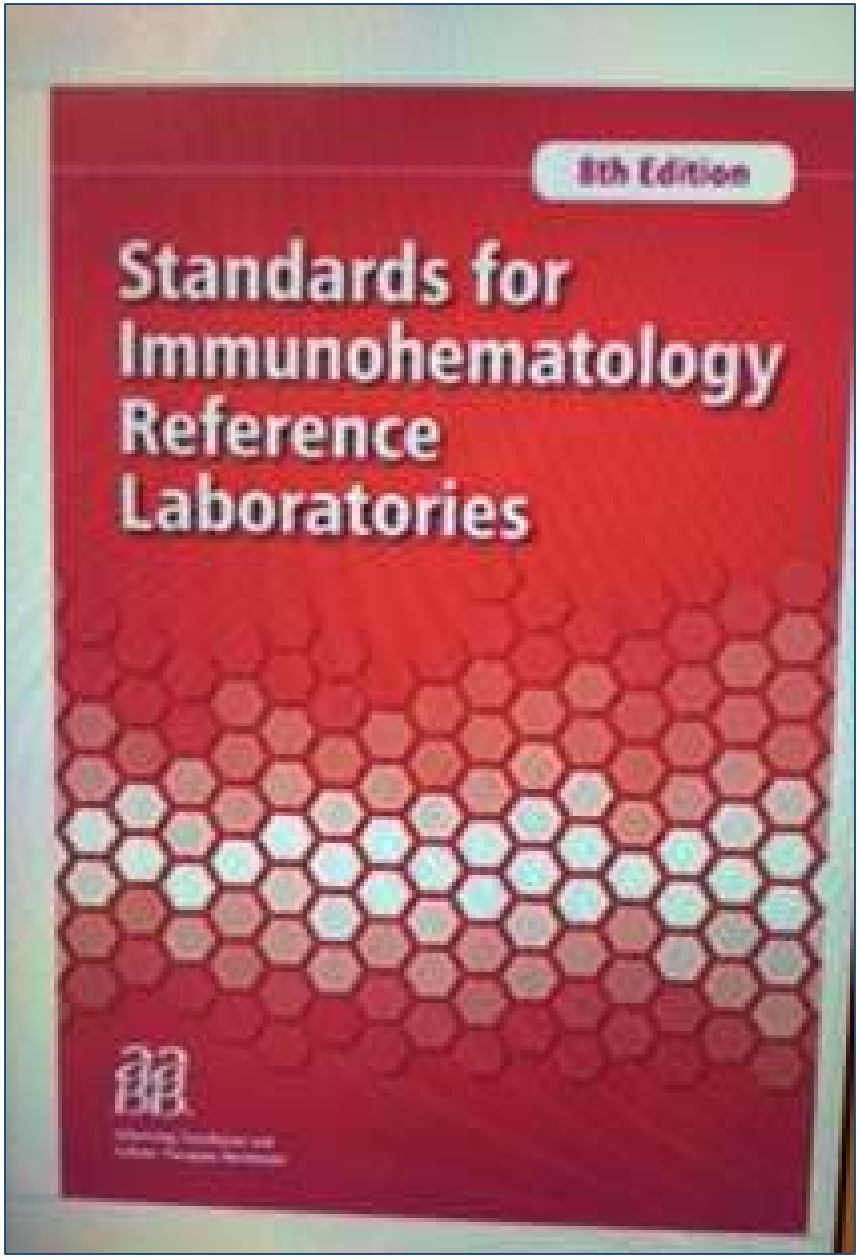
- Low throughput – PCR-SSP, PCR-RFLP, Nested PCR, Multiplex Etc – Genotyping of common antigens
- Medium throughput – PCR sequencing, Quantitative PCR etc – Weaker variants, Non invasive fetal RhD typing, Rh zygosity testing, SNP genotyping etc. – More senstive, no post PCR processing required
- High throughput – Microarrays, Mini sequencing

Quality in Immunohematology

- Immunohematology standards
- Role of D&CA of India, NABL, NABH, NIB
- Standards for reagents
- EQAS
- QC of procedures

Expectations in India

- Indian resources – Reagents, panels, Technology
- Research – Techniques, application
- Guidelines for processes and procedures
  - Blood grouping
  - Compatibility testing
  - Testing in cord blood & neonates
  - Antenatal serology
  - Resolution of cell serum discrepancies & incompatibilies
- Rare blood group registry, Compatible platelts for refractory patients
- TQM for Immunohematology
- Teaching, training and knowledge sharing


8th Edition
Standards for Immunohematology Reference Laboratories

Working Party / Task force for Immunohematology

Thanks