

14th PAN ARAB
TRANSFUSION
MEDICINE
CONFERENCE
QATAR 2024



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وزارة الصحة العامة
Ministry of Public Health
دولة قطر - State of Qatar



30 November to 2 December 2024

Sheraton Grand Doha Resort & Convention Hotel,
Doha, Qatar

Red Cell Genotyping Kuwait's Experience

Dr. Hanan Alawadhi
Medical Director

Kuwait Blood Transfusion Administration Services

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Disclosure Statement

I make the following declaration in relation to this CPD Activity :

- This complies with the Ministry of Public Health in Qatar Department of Healthcare Professions MoPH-DHP accreditation standards.
- There is NO Conflict of Interest.
- There is no plagiarism or copyright infringement.
- The content is balanced and free of bias, either commercial or non-commercial.

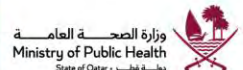
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Overview

- Red cell genotyping.
- Red cell antigens.
- Applications in transfusion medicine.
- Kuwait experience with Red Cell Genotyping.

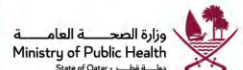
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Red Cell Genotype

A molecular method used to determine the genetic makeup of red blood cell antigens.



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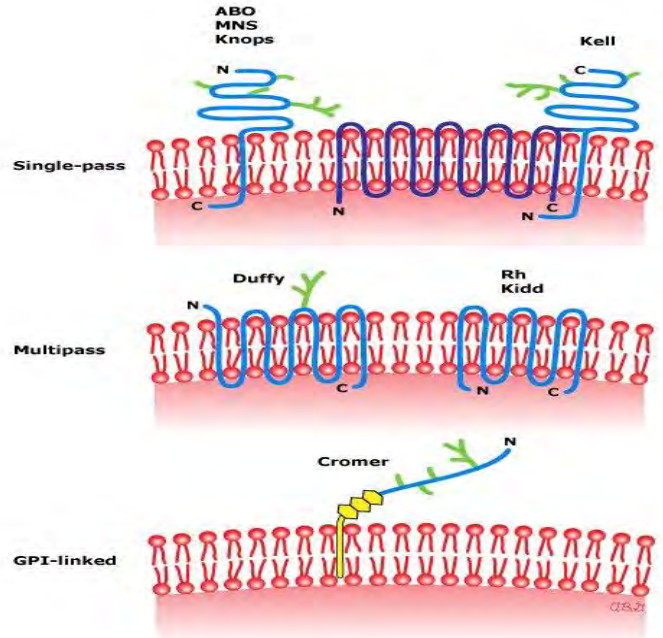


RBC Antigens

- Antigens are sugars and proteins → integrally linked to membrane proteins or lipids.
- The antigens have cellular functions with clinical relevance.



Major types of RBC blood group antigens and their relationship to the RBC membrane



RBC Antigens Significance

- Important in pretransfusion testing.
- Ability to initiate immune response.
 - Hemolytic transfusion reactions.
 - Hemolytic disease of the fetus and newborn (HDFN).
 - Autoimmune hemolytic anemia.



Method of Red Cell Genotyping

- DNA extraction
 - DNA is obtained from blood sample
- PCR amplification
 - The specific region of DNA related to blood group is amplified
- Genetic Analysis
 - Antigens, mutations or variants are identified.
 - Blood groups genotype are determined.



RBC Genotyping Applications in Transfusion Medicine

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RBC Genotyping Applications in Transfusion Medicine

- Patients
 - Optimizing transfusion therapy for patients requiring chronic transfusion
 - Type patients own RBCs after receiving multiple transfusions
 - Type patients own RBCs with positive DAT
 - Help identify RhD variants
 - Resolve A,B and RhD discrepancies



RBC Genotyping Applications in Transfusion Medicine

- Patients
 - Determine RhD type of fetus in RhD negative mothers
 - Patients receiving anti-CD 38 therapeutic agents.
 - Bone marrow transplant patients.

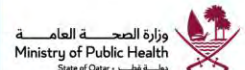
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RBC Genotyping Applications in Transfusion Medicine

- Donors
 - Genotype donors for certain antigens that are hard to ascertain because antisera are not available (e.g. Dombrock)
 - Type donors for antibody identification panels
 - Mass screen for antigen negative individuals
 - Find rare donors
 - Increase the inventory of antigen negative units.



RBC Genotyping Advantages

- Providing a valid type in recently transfused patient.
- Providing a valid type in the patient with a positive DAT.
- Typing antigens where antisera are not available.
- Identifying weak and variants antigens.
- Direct determination of zygosity.
- High throughput testing.

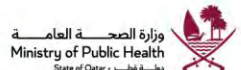
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RBC Genotyping Disadvantages

- Requires specialized facilities, equipment and personal.
- Expensive equipment and reagents.
- Unreliable results if the test subject has chimerism.
- Most laboratory systems can not handle the results.



What if there is a discrepancy
between genotype and serological
results ?



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Genotype and Serology Discordant Results

- In patients
 - If the serology is antigen negative and DNA is antigen positive, the serologic result is assumed to be correct.
 - Considered the safest practice to ensure that the patient receives antigen-negative units.



Genotype and Serology Discordant Results

- In donor unit
 - The unit is assumed antigen positive.
 - Consider the safest practice to ensure that incompatible antigens are not inadvertently transfused.



RBC Genotype Kuwait's Experience



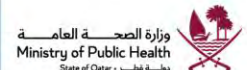
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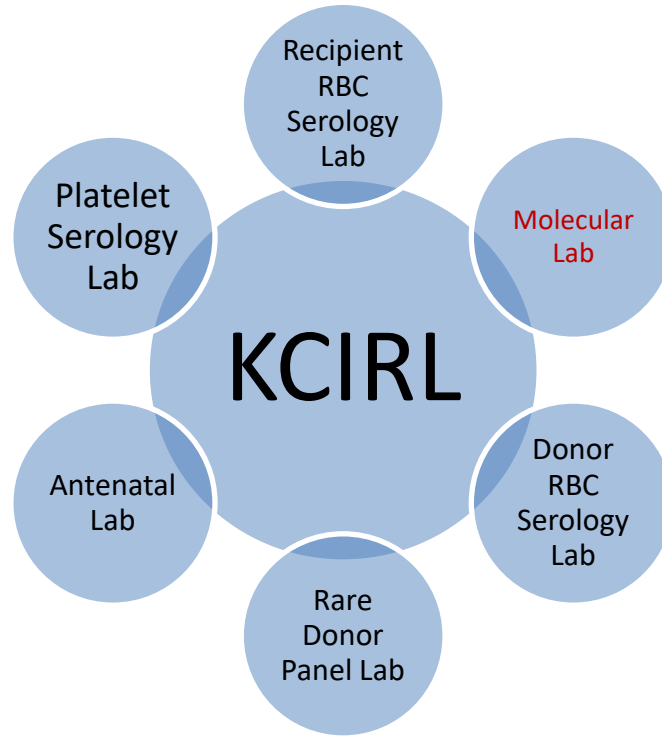
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Molecular Laboratory

- RhD variants.
- RBC antigens.
- Platelet antigens.
- HLA antigens.

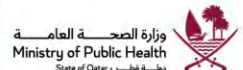
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BLOOD TRANSFUSION ADMINISTRATION SERVICES
KUWAIT CENTRAL BLOOD BANK
JABRIYA - STATE OF KUWAIT
MOLECULAR LABORATORY



RHD Typing Report

Date:

User:

Patient name:

Civil ID #:

Sample Id.:

Sample type:

Accessioning date:

Ordered by:

Ordering institution:

Test performed:

Software version:

Lot #:

Enzyme lot #:

Blood Group System	Alleles Assayed	Genotype Result	Antigens (ISBT)	Predicted Phenotype Result
Rh	RHD*weak D type 1 RHD*weak D type 2 RHD*weak D type 3 RHD deletion RHD*Pseudogene RHD*DIIIIA-CE(3-7)-D	Weak D Types 1, 2 and 3 not detected	D (RH1)	Weak D Types 1, 2 or 3 not detected ⁽⁹⁾

Legend

+: Normal antigen expression
0: Undetectable antigen expression
NC: No Call, result inconclusive
UN: highly unlikely. The antigen expression is not known.

Notes

⁽⁹⁾ RHD gene present. D- (RHD*DIIIIA-CE(3-7)-D or RHD*Pseudogene genotype) not detected

Comments and Recommendations

REVIEW AND APPROVAL

Technician Name:

Supervisor/Designee:

Medical Director/Designee:

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BLOOD GROUPS	ALLELES ASSAYED	PHENOTYPES (Antigens)
RhCE	RHCE* <u>ce</u> ; RHCE* <u>Ce</u> , RHCE* <u>cE</u> ; RHCE* <u>CE</u> , RHCE* <u>CeCW</u> , RHCE* <u>ceCW</u> , RHCE* <u>CECW</u> , RHCE* <u>ceAR</u> , RHCE* <u>CeFV</u> , RHCE* <u>CeVG</u> , RHCE* <u>cEFM</u> , RHCE* <u>ce</u> [712G], RHCE* <u>ce</u> [733G], RHCE* <u>ce</u> [733G,1006T], RHCE* <u>CE</u> - D[2, 5, 7]- <u>CE</u> , RHCE* <u>cE</u> [697G,712G,733G], RHD*r's-RHCE* <u>ce</u> [733G,1006T]	C (RH:2), E (RH:3), c (RH:4) e (RH:5), CW (RH:8), V (RH:10), hrS (RH:19) VS (RH:20), hrB (RH:31)
Kell	KEL*K_KPB_JSB, KEL*k_KPB_JSB KEL*k_KPA_JSB, KEL*k_KPB_JSA	K (KEL:1), k (KEL:2), Kpa (KEL:3), Kpb (KEL:4) Jsa (KEL:6), Jsb (KEL:7)
Kidd	JK*A, JK*B, JK*B_null(871C), JK*B_null(IVS5-1a)	Jka (JK:1), Jkb (JK:2)
Duffy	FY*A; F*B, FY*B_GATA, FY*B[265T]_FY*X	Fya (FY:1), Fyb (FY:2)
MNS	GYPA*M, GYPA*N, GYPB*s, GYPB*S, GYPB* <u>Mur</u> , GYPB* <u>deletion</u> , GYPB*S null(230T), GYPB*S null(IVS5+5t)	M (MNS:1), N (MNS:2), S (MNS:3), s (MNS:4) U (MNS:5), Mia (MNS:7)

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BLOOD GROUPS	ALLELES ASSAYED	PHENOTYPES (Antigens)
Diego	DI*A, DI*B	<u>Dia</u> (DI:1), <u>Dib</u> (DI:2)
<u>Dombrock</u>	DO*A, DO*B, DO*B_HY, DO*A_JO	<u>Doa</u> (DO:1), <u>Dob</u> (DO:2) <u>Hy</u> (DO:4), <u>Jo</u> (DO:5)
Colton	CO*A, CO*B	<u>Coa</u> (CO:1), <u>Cob</u> (CO:2)
Cartwright	YT*A, YT*B	<u>Yta</u> (YT:1), <u>Ytb</u> (YT:2)
Lutheran	LU*A, LU*B	<u>Lua</u> (LU:1), <u>Lub</u> (LU:2)
Knops	KN*A, KN*B	<u>Kna</u> (KN:1), <u>Knb</u> (KN:2)
Landsteiner-Wiener	LW*A, LW*B	<u>LWa</u> (LW:5), <u>LWb</u> (LW:7)
<u>Vel</u>	VEL*01, VEL*-01	<u>Vel+</u> , <u>Vel-</u>

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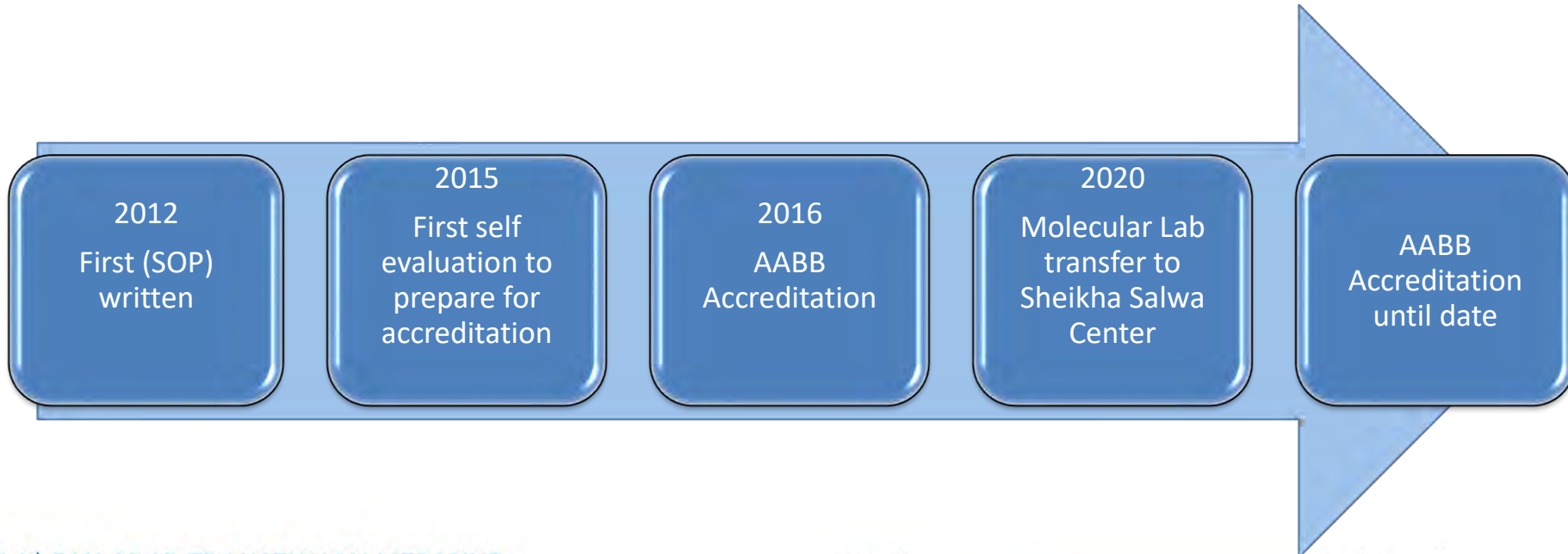


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Kuwait Molecular Laboratory Journey



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Sheikha Salwa Cord Blood

having been assessed by AABB, has been found to meet the requirements of applicable Standards of this organization and therefore is granted this

CERTIFICATE OF ACCREDITATION

for the following activities:

Donor Center Activities

Molecular Testing Activities

In Witness whereof the undersigned, being duly authorized, have caused this Certificate to be issued and the AABB Corporate Seal to be affixed.

Effective Dates:

October 15, 2024 - December 31, 2025

A handwritten signature in black ink, reading "Aaron Tolian".

President, AABB

A handwritten signature in black ink, reading "Kevin Land".

Chair, Accreditation Program Committee

The Molecular Testing Accreditation Program provides a forum for laboratories using molecular methods to predict blood group antigens on red cells, platelets, and neutrophils in order to provide compatible blood and components for transfusion.

The list of AABB accredited Molecular Testing Laboratories specifies those facilities that have attained AABB accreditation for the purpose of testing for blood group genes in order to screen a blood donor population or to determine predicted blood group phenotypes in patients.

Note: The table below is sorted alphabetically by Facility name. To change the table format temporarily, simply click on any column heading.

Hospital Israelita Albert Einstein ¹	Sao Paulo	SP	BRA
Lifesouth Community Blood Centers, Inc.	Gainesville	FL	USA
National Center For Blood Group Genomics	Kansas City	MO	USA
New York Blood Center -LIC	Long Island City	NY	USA
Sheikha Salwa Cord Blood			KWT
The American National Red Cross – Philadelphia, PA	Philadelphia	PA	USA

Facility name ¹	City	State	Country
Carter BloodCare ¹	Bedford	TX	USA
Grifols Laboratory Solutions ²	San Marcos	TX	USA
Hospital Israelita Albert Einstein ¹	Sao Paulo	SP	BRA
Lifesouth Community Blood Centers, Inc.	Gainesville	FL	USA
National Center For Blood Group Genomics	Kansas City	MO	USA
New York Blood Center -LIC	Long Island City	NY	USA
Sheikha Salwa Cord Blood			KWT
The American National Red Cross â€¢ Philadelphia, PA	Philadelphia	PA	USA

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¹ Indicates that this facility has received a variance from a specific standard.

² Indicates that this facility has partial or limited conformance with requirements.

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External Quality Assurance

- UK NEQAS
- CAP proficiency testing

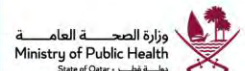
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Conclusion

- Red cell genotyping enhances the precision and safety of blood transfusions
- Particularly beneficial in managing complex cases
- Represents the future of personalized transfusion medicine.

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Thank you

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