

Kidd Blood Group System

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History of Kidd Blood Group System

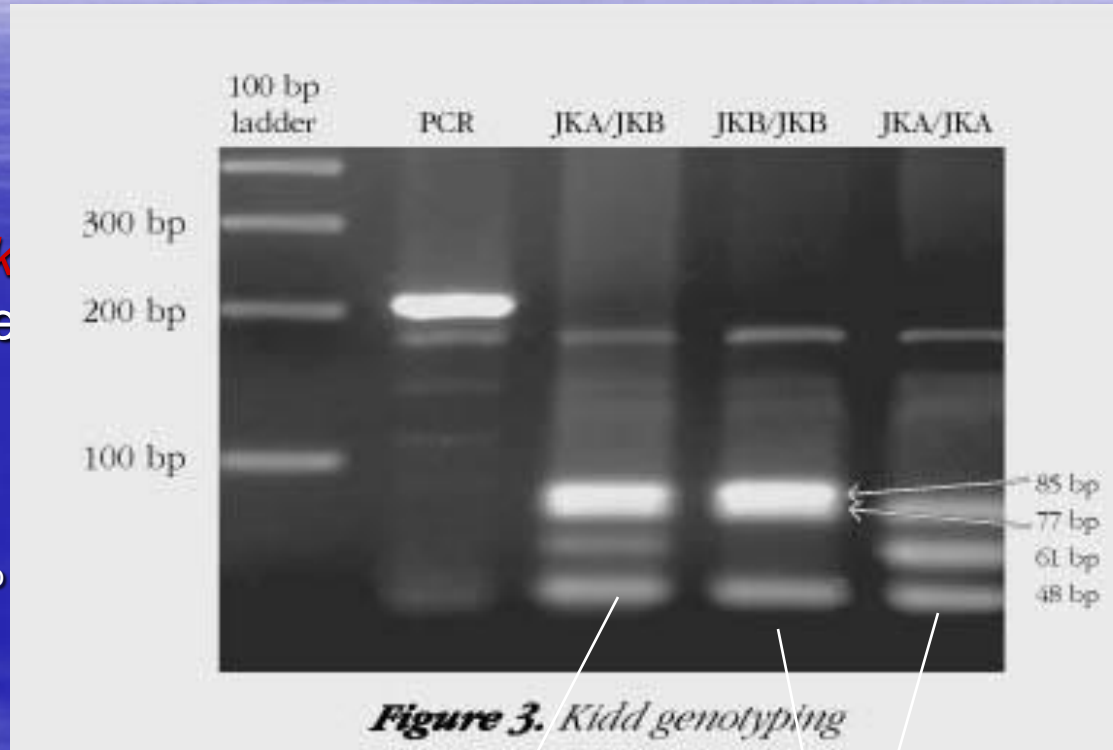
- Jka was discovered in 1951 by Allen: Mrs. Kidd had hemolytic disease of newborn (HDN) in her son. A new RBC alloantibody was detected in her serum, reacted with her husband's RBCs.
- Jkb was found in 1953 by Plaut
- The antigens were independent of other known blood groups. They named after Mrs. Kidd.
- Jk null phenotyp was found in 1959 by Pinkerton. Since the specificities were inseparable, the antibody was renamed anti-Jk3 which recognizes an antigen found whenever Jka or Jkb is present.

ISBT Human Blood Group Systems

ISBT Number	Name	Abbreviation
001	ABO	ABO
002	MNS	MNS
003	P	P
004	Rh	RH
005	Lutheran	LU
006	Kell	KEL
007	Lewis	LE
008	Duffy	FY
009	Kidd	JK
010	Diego	DI
011	Cartwright	YT
012	XG	XG
013	Scianna	SC
014	Dombrock	DO
015	Colton	CO
016	Landsteiner-Wiener	LW
017	Chido/Rodgers	CH/RG
018	Hh	H
019	Kx	XK
020	Gerbich	GE
021	Cromer	CROM
022	Knops	KN
023	Indian	IN
024	Ok	OK
025	Duffy	Duffy

Kidd Antigens

- Genotype:
 - Genes located on chromosome 18
 - Three alleles Jk^a , Jk^b , Jk^k
 - Co-dominant Inheritance
 - Jk^k is a silent allele
- Common antigen ---- JK^3 Ag:
 - Present with Jk^a and/or Jk^b antigens
 - Whenever you have Jk^a or Jk^b antigens on the RBC you also have Jk^3 antigen.
 - Anti- Jk^3 is against Jk^a , Jk^b , Jk^3 antigens, transfuse with $Jk(a-b-)$ blood, very difficult to find



Heterozygous
for JKA and JKB.

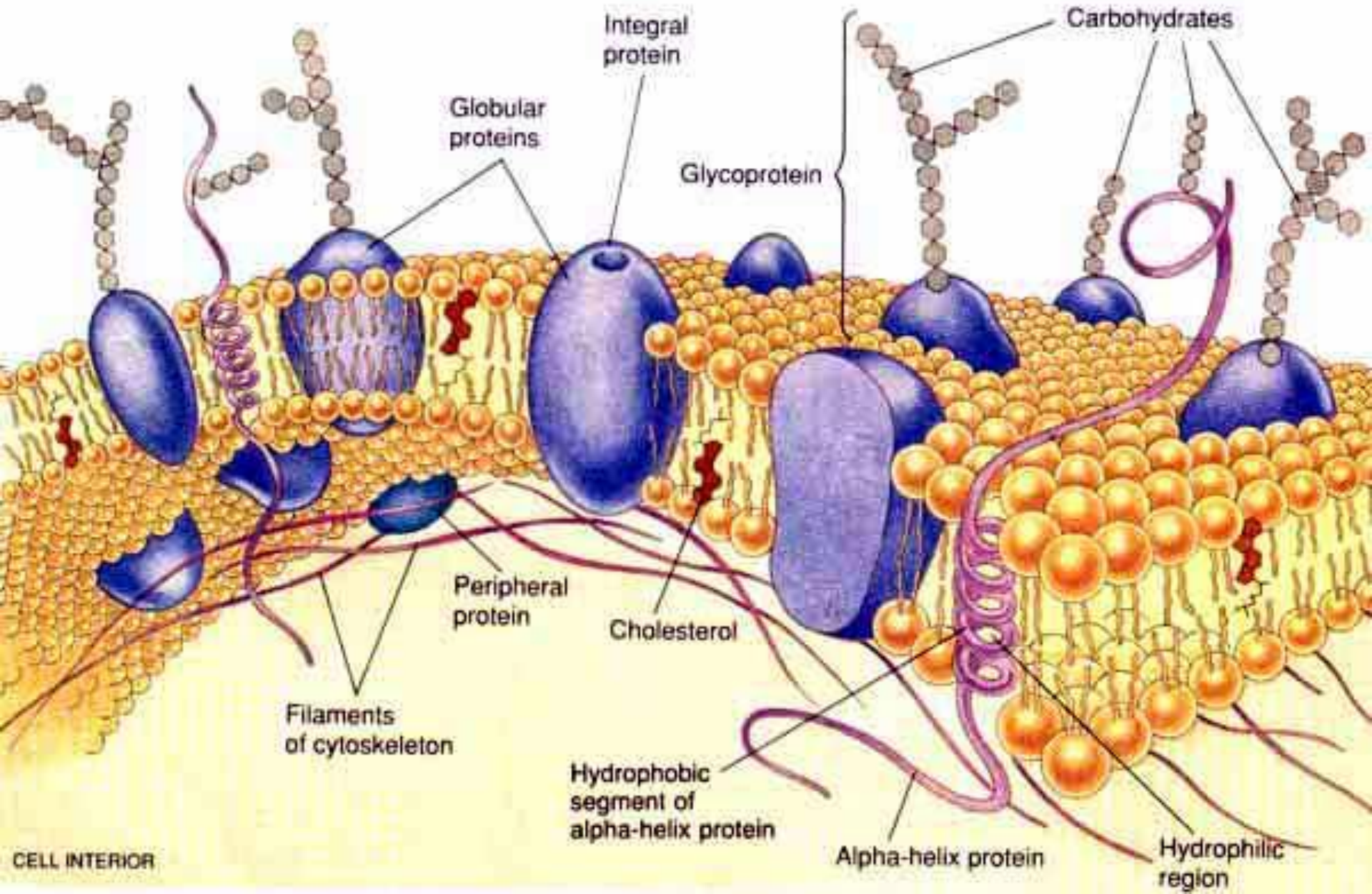
Homozygous
for Jka or Jkb

Kidd Antigens

- Jka and Jkb Antigens:
 - Single protein band that is part of the RBC Urea transport system.
 - People who are Jk (a–b–) resist lysis in 2M Urea for 15 to 30 minutes. Jk^a or Jk^b cells swell and burst rapidly.
 - The Jka/Jkb polymorphism is a A8386 base pair change at amino acid 280, changing Asp to Asn
- Jka Frequency: 77% whites, 91% Blacks and 73% Asians
- Jkb Frequency: 72% Whites, 43% Blacks and 77% Asians
- Finding antigen negative donor units:
 - Jka= 23% ≈ 25%
 - Jkb = 28% ≈ 30%

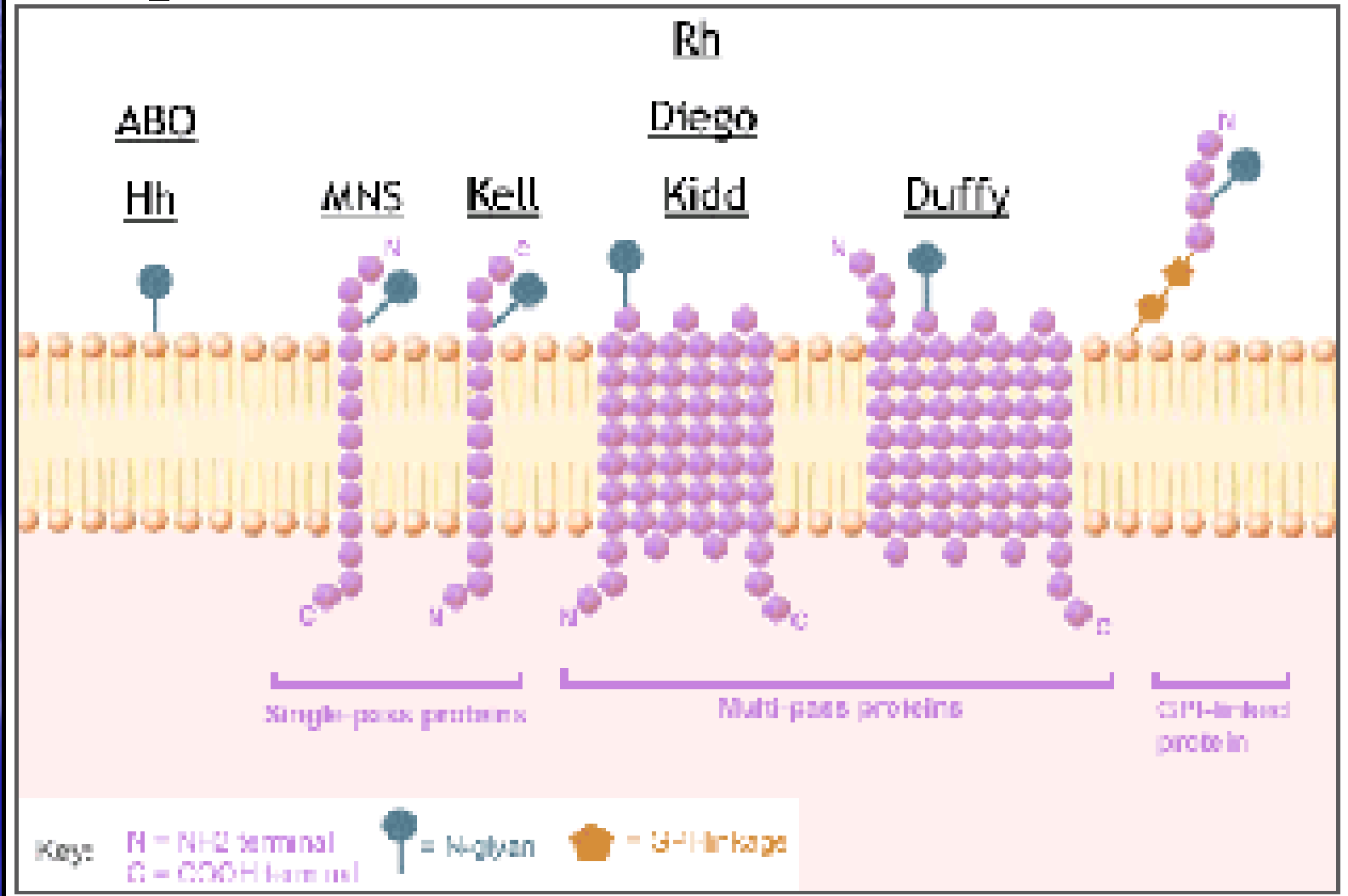
A Schematic Picture of RBC Cell Membrane

CELL EXTERIOR



CELL INTERIOR

(GPI)-linked proteins. Click on the blood groups to find out more about the antigens that define it.



Kidd Antigens

- Antigens are well developed at birth, present at 11 weeks of gestation: cause HDN, but usually is mild case, but fatal cases have been reported in the literature
- Enzymes **ENHANCE** antigen expression: Ficin or Papain treatment of red blood cells **enhances** anti-Jk reaction strength (makes stronger).
- Kidd antigens are not very immunogenic compared to Kell or Rh Ag: 1 mismatched transfusion – 0.7% will have anti-Jk

Kidd Antigens

- Antigens are also present in the endothelial cells of the kidney.
 - JK null phenotype patients can not maximally concentrate their urine
 - Kidd mismatched kidney transplant has higher rate of graft failure in the short term, but will be re-endothelialized in few weeks.

Kidd Phenotype Frequencies

Phenotype	Whites (%)	Blacks (%)	Asians (%)
Jk (a+ b-)	28	57	23
Jk (a+ b+)	49	34	50
Jk (a- b+)	23	9	27
Jk (a- b-)	Exceedingly rare		Rare

Jka Frequency: 77% whites, 91% Blacks and 73% Asians

Jkb Frequency: 72% Whites, 43% Blacks and 77% Asians

Jk null Phenotype

- no Jk^a, Jk^b, Jk³ antigen
- People who are Jk (a–b–) resist lysis in 2M Urea for 15 to 30 minutes. Jk^a or Jk^b red blood cells would swell and burst rapidly.
- Testing cells in 2M Urea is used as a screening process to detect Jk null red cells.
- The molecular basis: splice-site, missense mutations, and a partial gene deletion.

Jk null Phenotype

- The first example of the Jk(a-b-) phenotype was found in a woman who experienced a delayed transfusion reaction. She was a Filipino of some Chinese and Spanish ancestry. Another family of Filipino-Chinese ancestry was reported that contained three Jk(a-b-) members.
- Since these first reports, many such individuals of Asian or Polynesian extraction have been identified.
- One study found a total of 66 (0.9%) Jk(a-b-) donors among 7425 tested; all were of Polynesian backgrounds. Other populations reporting this phenotype include tribes from Mato Grosso, Brasil, Hindus from India and Japanese blood donors.
- The Jk(a-b-) phenotype is strikingly absent from Caucasians.

Kidd Antibodies

- Anti-Jk^a and anti-Jk^b are IgG, clinically significant, exposure-requiring, warm-reacting
- Marked dosage effect: anti-Jk^a reacts much stronger against homozygous cells [Jk(a+,b-)] than heterozygous cells [Jk(a+,b+)], so require a homozygous cell on the panel to rule out anti-Jk
- Jk(a+,b-) cells have 14,000 antigen sites per cell
- Dosage effect also present in Duffy, MNSs, Rh system, but not as marked as Kidd Ab

Kidd Antibodies

- Kidd antibodies are IgG, but they are capable of cause intravascular hemolysis due to the capability of fixing complement intravascularly in contrast to most other IgG antibodies (they do not fix complement, do not cause intravascular hemolysis)
- Antibody titers vary over time or may completely disappear, but surge over second exposure to cause delayed hemolytic transfusion reaction (DHTR) – use peg or enzymes to enhance the reactivity of antibodies

Kidd Antibodies

- Anti-Jka, Jkb are notorious (or famous) for causing DHTR and it tends to be more severe than other antibodies due to intravascular hemolysis
- HDN associated with Kidd antibodies are tends to be mild.

Practice Questions

- About how many donors will need to be antigen-typed to find 3 Jka= units for crossmatch?
 - A. 3
 - B. 5
 - C. 12
 - D. 10
 - E. 8

Practice Questions

- Which antibody is most commonly associated with delayed hemolytic transfusion reaction?
 - A. Anti-s
 - B. Anti-K
 - C. Anti-Lua,
 - D. Anti-Jka
 - E. Anti-E

Practice Questions

- Which blood group system is known for showing dosage effect?
 - A. Lewis
 - B. P
 - C. Kidd
 - D. Rh
 - E. Kell

Practice Questions

- Which antibody cause most severe form of hemolytic disease of newborn?
 - A. Anti-s
 - B. Anti-K
 - C. Anti-Lua,
 - D. Anti-Jka
 - E. Anti-E

Practice Questions

- Which antigen is routinely **destroyed** by enzymes?
 - A. P1
 - B. JKa
 - C. Fya,
 - D. K
 - E. E