Immunohematology Case Studies 2020 - 2

Gregory R Halverson, MT(ASCP)SBB,DLM
LifeSouth Community Blood Centers
Immunohematology Reference Laboratory
grhalverson@lifesouth.org

Clinical History

- 71 year old African American male with Sickle Cell Disease
- Blood type B+, Anti-C in history
- No record of red cell phenotype or molecular genotype
- Recently transfused 8 pRBC units 1 month prior for cardiac surgery

Preliminary Test Results

ABO/Rh: B, D-Pos

DAT: Positive 2+ with anti-IgG only

Antibody Screen Method: LISS-IAT (Immucor)

Antibody Screen Results: Positive

Antibody Id. Method: LISS-IAT (Immucor)

Antibody Id. Preliminary Results: Anti-C, + ??

Panel Sample Results

15’ LISS-IAT, Eluate and Last Wash

Previous anti-C in History

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	LISS IAT	Eluate	Last wash
1	+	0	+	+	0	0	+	0	+	+	+	0	+	+	0	+	0	+	2+	2+	0
2	0	+	0	0	+	0	+	0	0	+	+	0	0	+	+	+	0	0	1+	2+	
3	0	+	0	+	+	0	+	0	+	0	+	0	+	+	+	+	+	+	1+	1+	
4	0	0	+	+	+	0	+	0	+	+	0	0	+	+	+	0	+	+	2+	2+	0
5	0	0	+	+	0	0	0	0	+	0	+	0	+	+	+	+	+	+	2+	1+	
6	0	+	0	+	+	+	+	+	+	+	+	0	+	+	+	+	+	0	3+	2+	
7	0	0	0	+	+	+	+	0	+	+	0	0	+	+	+	0	0	+	3+	2+	0
8	0	0	0	+	+	0	+	+	0	0	+	+	0	+	0	+	0	+	1+	1+	
9	0	0	0	+	+	0	+	+	0	0	+	+	0	0	+	0	+	0	1+	1+	
10	0	0	0	+	+	0	+	0	+	+	0	0	0	+	0	+	+	0	1+	2+	
11	+	+	0	+	+	0	+	0	0	+	+	0	+	+	+	+	0	0	0	2+	0
AC																			2+		

Interpretation of Plasma Panel and Elution Results

- The LISS-IAT panel was positive at variable strength with 10 out of 11 cells. The red cell phenotype is: R1r, Fy(a-b-), Le(a-b+), S-s-U-
- A rapid acid eluate was reactive with all cells at various strengths, Last wash was negative.
- Based upon the plasma reactions we can exclude antibodies to e [RH5], k [KEL2], P1 [$P1P^k1$] and -Le^b [LE2]
- Additional testing needed

Selected Cell Panel: Plasma (LISS and Ficin) and Eluate

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s		LISS IAT	Ficin	Eluate
1	+	0	0	+	+	0	+	+	0	+	+	0	+	+	0	+	0	+		1+	1+	1+
2	+	0	0	+	+	0	+	0	+	+	0	+	0	+	+	+	0	+		1+	1+	2+
3	+	+	0	0	+	0	+	0	0	0	+	0	+	+	+	+	0	+		1+	1+	0
4	+	0	+	+	0	0	+	0	0	+	+	+	0	+	+	0	0	+		2+	3+	1+
5	+	0	0	+	+	+	0	0	0	0	+	0	0	+	+	0	0	+		1+	2+	0
6	+	0	0	+	+	0	+	0	0	+	0	0	0	+	+	0	0	+		0	0	2+
7	+	0	0	+	+	0	+	0	0	+	+	0	0	w	+	+	+	0		0	0	1+
8	+	0	0	+	+	+	+	0	0	+	0	0	+	+	0	0	0	+		W+	1+	2+
AC																					3+	

With these plasma results can also exclude antibodies to c [RH4], Jk^a [JK1], M [MNS1], S [MNS3] and s [MNS4]

Eluate excludes D [RH1], C [RH2], c [RH4], e [RH5], K [KEL1], k [KEL2], Jk^b [JK2], Le^b [LE2], P1 [$P1P^k1$], M [MNS1] and s [MNS4]

Selected Cell Panel: Plasma (LISS and Ficin) and Eluate

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	LISS IAT	Ficin IAT	Elu IAT
1	+	0	0	+	+	0	+	0	0	0	+	0	+	+	0	+	0	+	0	0	0
2	+	+	0	0	+	0	+	0	0	0	+	+	0	+	+	+	+	0	W+	1+	0
3	+	0	+	+	+	0	+	0	0	+	0	0	+	+	+	+	+	+	2+	3+	2+
4	+	0	0	+	+	0	+	+	0	0	+	0	+	+	+	0	+	+	1+	1+	1+
5	+	0	0	+	+	0	+	0	+	0	+	0	+	+	+	+	+	+	1+	1+	1+
6	+	0	+	+	0	+	+	0	0	0	+	0	+	+	0	+	+	0	1+	2+	0
7	0	0	0	+	+	+	0	0	0	0	+	0	+	+	+	0	0	+	1+	2+	0
8	0	0	0	0	0	0	+	+	0	0	+	+	0	+	0	+	0	+	0	0	0
9	0	0	0	0	0	0	+	0	+	0	+	+	0	0	+	0	+	0	0	0	0
10	+	0	0	+	+	0	+	0	0	+	0	0	0	+	0	+	+	0	0	0	2+

- **Plasma results exclude anti-D,-c,-Jk^b,-Le^a and-N**
- **Eluate excludes anti-E,-Le^a,-N and-S**
- What is interesting about cells #8 and #9?

Panel Exclusions for Plasma and Eluate

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	LISS IAT	Eluate	Last wash
1	+	0	+	+	0	0	+	0	+	+	+	0	+	+	0	+	0	+	2+	2+	0
2	0	+	0	0	+	0	+	0	0	+	+	0	0	+	+	+	0	0	1+	2+	
3	0	+	0	+	+	0	+	0	+	0	+	0	+	+	+	+	+	+	1+	1+	
4	0	0	+	+	+	0	+	0	+	+	0	0	+	+	+	0	+	+	2+	2+	0
5	0	0	+	+	0	0	0	0	+	0	+	0	+	+	+	+	+	+	2+	1+	
6	0	+	0	+	+	+	+	+	+	+	+	0	+	+	+	+	+	0	3+	2+	
7	0	0	0	+	+	+	+	0	+	+	0	0	+	+	+	0	0	+	3+	2+	0
8	0	0	0	+	+	0	+	+	0	0	+	+	0	+	0	+	0	+	1+	1+	
9	0	0	0	+	+	0	+	+	0	0	+	+	0	0	+	0	+	0	1+	1+	
10	0	0	0	+	+	0	+	0	+	+	0	0	0	+	0	+	+	0	1+	2+	
11	+	+	0	+	+	0	+	0	0	+	+	0	+	+	+	+	0	0	0	2+	0
		C	**E**			**K**		**Fy5**	**Fy5**												
								Fy5	**Fy5**	**Jk^a**											

Interpretation of Results

- Plasma contains antibodies to C, E, K and Fy5
- Eluate contains anti-Jk^a and -Fy5
- For future transfusions RBCs should be C, E, K, Fy^a, Fy^b and Jk^a negative
- What could explain the absence of anti-Jk^a in the plasma?

Determining Fy3 vs Fy5

RBC Phenotype	Ethnicity	Fy3	Fy5
Fy(a+b-)	Black or Caucasian	Positive	Positive
Fy(a-b+)	Black or Caucasian	Positive	Positive
Rh null Fy(a-b-)	Black or Caucasian	Negative	Negative
Rh null Fy(a+b-)	Black or Caucasian	Positive	Negative
Rh null Fy(a-b+)	Black or Caucasian	Positive	Negative

Discussion and Conclusions

- There is evidence of a delayed transfusion reaction due to anti-Jk^a and anti-Fy5
- The Jk^a antibody was probably not detected in the plasma because all of the transfused Jk(a+) red cells have been sequestered or hemolyzed
- Anti-Fy5 is not a frequently encountered specificity and documented delayed transfusion reactions are rare

Summary of Case Challenges

- A case of multiple antibodies produced after receiving 8 units of pRBC
- Multiple reactions of various strength need sorting out with selected cells
- Results require use of rare cells to include or exclude rare antigens
- Thawing Rh null cells is only for academic reasons as these results will not change the type of blood selected for transfusion
- Requires knowledge of blood groups and how different systems interact with each other

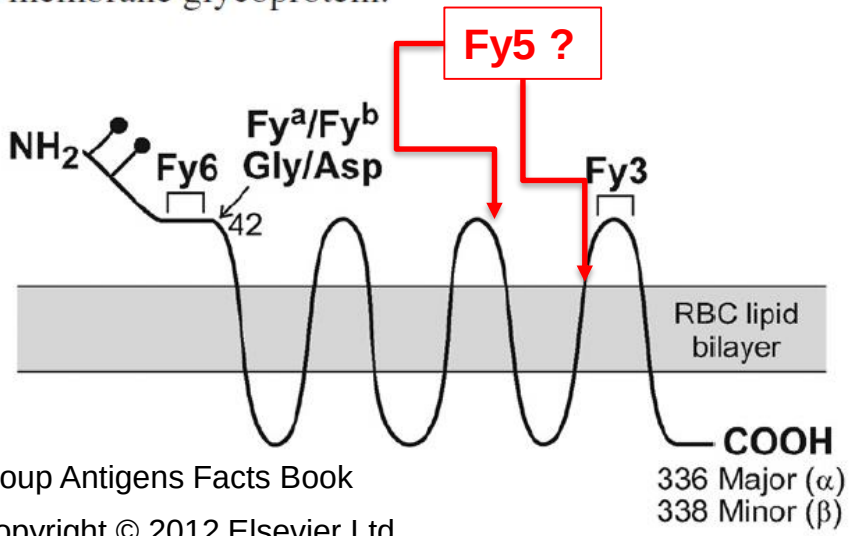
Lessons Learned by the Case

- Several examples of anti-Fy5 have been found. All are in black, multiply transfused SCD patients that are Fy(a–b–)
- Fy(a–b–) RBCs from black individuals are generally FY:–3,–5; the exceptional Fy(a-b-) from Caucasians are FY:–3,5
- Rh_{null} RBCs are FY:3,–5
- Anti-Fy3 agglutinates Rh_{null} RBCs, while anti-Fy5 does not

The FY Membrane Protein

Carrier molecule

A multipass membrane glycoprotein.



The Blood Group Antigens Facts Book
3rd Edition, Copyright © 2012 Elsevier Ltd.

- The molecular basis of the Fy5 antigen is unknown
- The exact nature of the interaction between the FY and RH glycoproteins is not fully understood

References:

1. Colledge, K.I., et al., 1973. Anti-Fy5, an antibody disclosing a probable association between the Rhesus and Duffy blood group genes. Vox Sang 24, 193–199.
2. Pogo, A.O., Chaudhuri, A., 2000. The Duffy protein: a malarial and chemokine receptor. Semin Hematol 37, 122–129.
3. Chaudhuri, A., et al., 1995. The coding sequence of Duffy blood group gene in humans and simians: restriction fragment length polymorphism, antibody and malarial parasite specificities, and expression in nonerythroid tissues in Duffy-negative individuals. Blood 85, 615–621.
4. The Blood Group Antigens Facts Book, 3rd Edition, 2012, Reid ME, Lomas-Francis C, Olsson M. editors.