CASE REPORT: RARE ANTIBODY AGAINST HIGH FREQUENGY FY^5

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Introduction

The Duffy (FY) blood group system consists of 6 antigens. Fy^3 and Fy^5 are expressed on red blood cells (RBC) of all Duffy phenotypes apart from Fy(a-b-), whereas Fy^5 is not present on Rh_{null} cells even if there is a *FY* gene. This phenomenon suggests that Fy^5 is a composite antigen of FY and RH proteins. Both Fy^3 and Fy^5 are, in contrast to other FY antigens, protease-resistant antigens. Anti-Fy^5 has been associated to delayed HTR.

We report a case of anti-Fy^5 in a 24-year-old African, gravida 2, para 0, with transfusion dependent sickle cell disease. The patient's red cells presented Fy(a-b-) phenotype with homozygous c.1-67T>C mutation of *FY*B* alleles. In the past, the patient received multiple transfusions of Fy^b positive RBC without sequelae except forming anti-E.

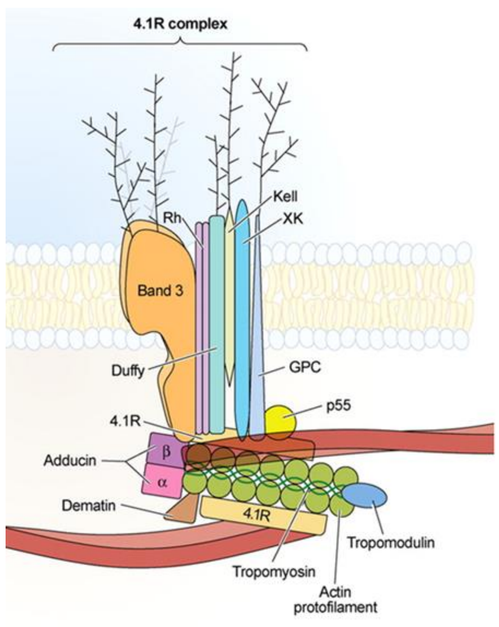

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Figure 1: The proximity between the Rhesus and Duffy proteins in the 4.1R-complex may explain the dependence of the two systems to present Fy^5.

Methods

Standard serological methods for antibody detection and specification were used (gel-card and tube test; BioRad, Cressier, CH). The KEL, JK, FY and MNS systems were analyzed by molecular typing with PCR-SSP (inno-train GmbH, Kron berg i. T, D).
Monocyte monolayer assay (MMA) was carried out for assessing the likely clinical significance of RBC antibodies.
Paternal serological typing was performed (Erytra®, Grifols, Duedingen, CH) in order to predict the antigen profile of the fetus.

Aknowledgements

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Results

The indirect antiglobulin test (IAGT) showed weakly reactive anti-Fy5, which was positive with all test cells, including papainized cells, except Fy(a-b-) cells and Rh_{null} Fy(a+b+) cells. Anti-E was only reactive on enzyme treated RBC. Based on molecular typing, the patient's predicted phenotype was R_0r, K-k+, Fy(a-b-), Jk(a-b+).
Paternal antigen profile showed incompatibility in the FY and JK blood group systems, namely Fy(a-b+),Jk(a+b-).
The MMA of anti-Fy^5 on O rr, Fy(a-b+) RBC revealed 0.7% reactive monocytes.

Currently we have 4 registered C-, E-, Fy(a-b-), Jk(a-) blood group O donors in Switzerland.
In total 6 fully antigen compatible RBC products were transfused during pregnancy and further 2 perioperative when a semi-elective cesarean section was performed because of looming cardiac decompensation in 34th week of pregnancy.
Serological phenotype of the newborn was R_0r, K-, Fy(a-b-). Therefore the father must be most likely heterozygote for the c.1-67T>C mutation of the *FY*B* allele. Hence, the newborn presented a negative direct antiglobulin test and no clinical signs of HDFN.

	Rh-hr		Kell					Duffy		Kidd		Lewis		P	MNS				Luth.		Xg		Spez. Antigene / Spacial types / Antigènes part. / Antigeni particolari / Otros Antigenos / Tipos especiais		Resultat / Result / Risultato / Resultado	
	Rh-hr		D	C	E	c	e	C^w	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P$_1$	M	N	S	s	Lu^a	Lu^b	Xg^a			LISS / Coombs	Enzyme
1	CCC^{w}D.ee	$R_1{}^wR_1$	017517	+	+	0	0	+	+	0	+	0	+	nt	nt	+	0	+	+	0	+	+	+	+	0	0	+	+		1	1+	2
2	CCD.ce	R_1R_1	636442	+	+	0	0	+	0	+	+	0	+	nt	nt	0	+	+	+	0	0	+	+	+	0	0	+	+		2	1+	1
3	ccD.EE	R_2R_2	506421	+	0	+	+	0	0	0	+	0	+	nt	nt	0	+	0	+	+	0	+	0	+	+	0	+	+		3	1+	2
4	Ccddee	r'r	844154	0	+	0	+	+	0	0	+	0	+	nt	nt	+	0	0	+	+	0	+	+	0	0	+	+	+	Bg(a+)	4	1+	2
5	ccddEe	r"r	906779	0	0	+	+	+	0	0	+	0	+	nt	nt	+	+	+	0	+	0	0	+	+	+	0	+	+		5	1+	2
6	ccddee	rr	610182	0	0	0	+	+	0	+	+	0	+	nt	nt	+	0	0	+	0	+	+	0	+	0	0	+	+		6	1+	2
7	ccddee	rr	306322	0	0	0	+	+	0	0	+	0	+	nt	nt	0	+	+	0	+	0	+	0	+	0	0	+	0		7	1+	2
8	ccD.ee	R_0r	002340	+	0	0	+	+	0	0	+	0	+	0	nt	0	0	+	0	+	+	+	0	+	0	0	+	0		8	0	0
9	ccddee	rr	159302	0	0	0	+	+	0	0	+	0	+	nt	nt	0	+	+	0	0	0	0	+	0	+	0	+	0		9	1+	2
10	ccddee	rr	305388	0	0	0	+	+	0	0	+	0	+	nt	nt	+	0	+	0	+	+	+	0	+	0	+	+	+		10	1+	2
11	ccddee	rr	656242	0	0	0	+	+	0	0	+	+	+	nt	nt	+	0	+	0	0	+	+	+	+	0	+	0	+		11	1+	2
		R_0r	681208	+	0	0	+	+	0	0	+	+	/	/	0	0	+	+	0	0	+	0	+	0	+	0	+	+	F		0	0
		R_0r	492405	+	0	0	+	+	0	0	+	+	/	/	0	0	+	0	0	0	+	+	+	0	0	+	+	+			0	0
		R_0r	403618	+	0	0	+	+	0	0	+	0	+	/	/	0	0	+	0	0	+	+	+	+	+	0	+	+			0	0
	R_0r	Heiko 14 105 582		+	0	0	+	+	0	0	+	+	/	/	+	+	0	+	0	+	0	+	+	+	+	+	+	/	Eigene		1+	/
	R_0r	Heiko 14 105 803		+	0	0	+	+	0	0	+	+	/	/	+	0	+	0	0	+	0	+	0	+	0	+	+	/	T2, frisch		1+	/
	0 Rh- null			0	0	0	0	0	0	/	/	/	/	/	+	+	+	+	/	/	/	+	+	+	+	/	/	/			0	

Figure 2: Serological results of antibody differentiation in indirect antiglobulin test and with papain treated cells showing panreactivity with all cells except Fy(a-b-) and Rh_{null} cells.

Conclusion

So far, only few cases with anti-Fy^5 have been reported and its clinical relevance is obscure. In our case, the request of several compatible RBC in order to maintain hemoglobin level during pregnancy and for cesarean section was challenging. Based on in vitro data (MMA) we recommend transfusing Fy^b positive RBC if no Fy(a-b-) units were available.
By doing so, one has to keep in mind the potential risk of delayed hemolysis due to boosting of anti-Fy^5. According to postnatal assessment it is not possible to make any statement about diaplacental transmission of anti-Fy^5, as the inherited *FY* genotype was preventing HDFN.