THE BENEFIT OF USING GENOTYPED RED CELLS IN ANTIBODY IDENTIFICATION PANELS

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BACKGROUND

- The detection and identification of antibodies to red cell antigens are one of the most important and challenging issues in transfusion medicine.
- Presently there are 360 red cell antigens recognized by the ISBT Working Party on Red Cell Immunogenetics and Blood Group Terminology.
- Most of them belong to one of the 36 blood group systems.
- Some antigens with still unknown genetic background are part of collections, low incidence (series 700) or high incidence (series 901) antigens.
- The test cells used in commercial antibody identification panels are usually serologically typed for less than 30 clinically most important antigens.
- Thus the identification of many antibody specificities remains impossible when using commercial reagents.
- We developed antibody identification panels with red cells phenotyped for 24 antigens and additionally genotyped for 30 blood group alleles.
- These panels used in the daily routine should improve the pre-transfusion routine diagnostics and extend the range of detectable antibody specificities.

METHODS

- The antibody identification was performed in the indirect antiglobulin test using untreated and papain treated red cells in the gel technique.
- The cells in the panels were phenotyped for following antigens: RhD, C, c, E, e, C^w, K, k, $Kp^{a/b}$, $Fy^{a/b}$, $Jk^{a/b}$, $Le^{a/b}$, $Lu^{a/b}$, P1, M, N, S, s, Xg^a.
- Following 30 alleles were additionally genotyped by using inhouse PCR-SSP methods (1) (**Fig. 1**):
  *DO*01/*02* (for $Do^{a/b}$), *LU*18/*19* ($Au^{a/b}$), *YT*01/*02* ($Yt^{a/b}$), *DI*01/*02* ($Di^{a/b}$), *IN*01/*02* ($In^{a/b}$), *KEL*06/*07* ($Js^{a/b}$), *KEL*11/*17, LU*08/*14*, *LW*05/*07* ($LW^{a/b}$), *SC*01/*02*, *KN*01/*02* ($Kn^{a/b}$), *KN*03/*06* ($McC^{a/b}$), *KN*04/*07* (Sl^a/Vil), *KN*-05* (Yk^{a-}), *KN*-09* (KCAM-), *RHCE*02.09 (C^X), VEL*-01* (Vel-)
- Antibodies identified due to the genotype information were confirmed by serology using appropriate reference reagents.

RESULTS

- 20,986 blood samples of 9,063 different patients were tested in our reference laboratory from August 2014 till July 2018.
- In 249 blood samples (1.4%) derived from 136 patients (1.5%) following antibodies could be identified due to the information derived from the genotype of the test cells. (**Fig. 2** and **3**).

CONCLUSION

- The use of genotyped test cells in antibody identification panels extends the range of detectable antibody specificities and reveals rare specificities like anti-Kn^b, anti-Tar or anti-MAR.
- Genotyped red test cells accelerate the antibody identification and improve the pre-transfusion diagnostics.

REFERENCES

1. Scharberg E, Rink G, Portegys J, Rothenberger S, Gillhuber N, Richter E, Bugert P. The impact of using genotyped reagent red blood cells in antibody identification. Transfus Med Hemother 2018;45:218-224.

RESULTS

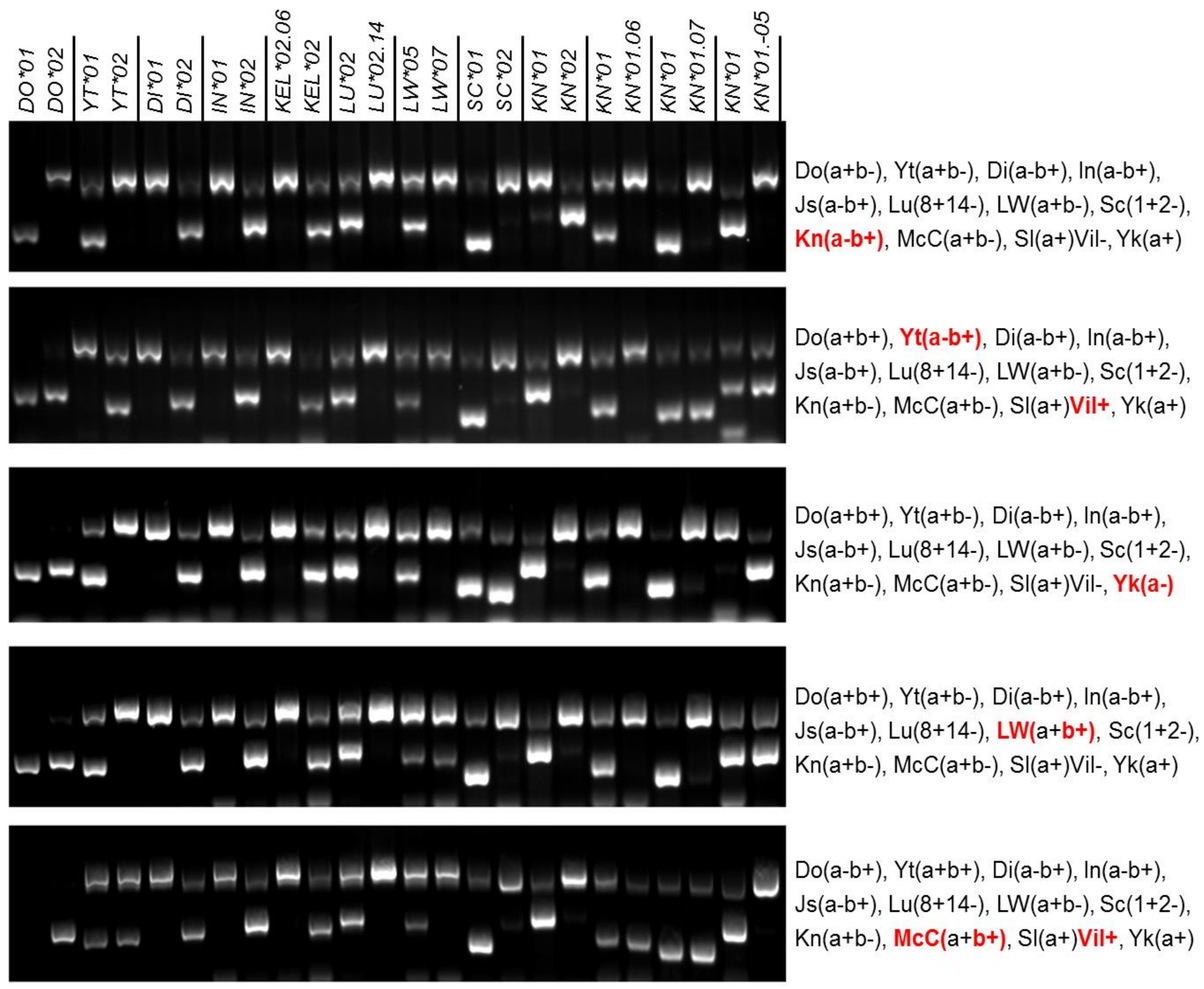

Figure 1: Representative results from PCR-SSP typing of donor samples. Deduced antigens are given on the right with rare phenotypes highlighted.

System	Antibody specificity	Number of patients	Number of samples
KN	Kn^a	21	31
	Kn^b	8	28
	Yk^a	19	29
	KCAM	6	22
	Sl(a)	1	1
	McC(a)	1	1
YT	Yt^a	20	30
	Yt^b	12	16
LU	Lu14	3	18
	Lu8	3	7
	Au(b)*	5	5
VEL	Vel	7	9
DO	Do^a	6	7
	Do^b	2	2
RH	MAR*	4	4
	Tar	1	2
DI	Di^a	2	21
	Wu	1	1
CO	Co^a	6	7
SC	Sc1*	2	2
	Sc2	1	1
LW	LW^a	3	3
	LW^b	2	2
	Total	136	249

* One auto-anti-Au(b), two auto-anti-MAR, one auto-anti-Sc1

Figure 2: Antibodies identified in 9,063 patients (20,986 blood samples) due to the genotype information of the test cells

	System			Rh - Hr						Kell				Duffy		Kidd		Lewis		P	MNS				Xg	Lutheran		Dombrock	Auberger		Spezial-Antigene Special types		Results	
	Rh - Hr		Component Lot	D	C	c	E	e	C^w	K	k	Kp^a	Kp^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P_1	M	N	S	s	Xg^a	Lu^a	Lu^b	Do^a *	Do^b *	Au^a *	Au^b *			IAT	Enzyme IAT
1	$C^wCD.ee$	$R1^wR1$	70217300496	+	+	0	0	+	+	0	+	0	+	+	0	0	+	0	+	$+^s$	0	+	0	+	0	0	+	0	+	+	+	Bg+ $Kn(a+^w)^s$	1	+	++
2	CCD.ee	R1R1	70117340241	+	+	0	0	+	0	+	+	0	+	0	+	0	+	+	0	0	+	0	0	+	+	0	+	+	+	+	0		2	—	—
3	ccD.EE	R2R2	70217321070	+	0	+	+	0	0	0	+	0	+	0	+	+	0	0	+	0	+	0	0	+	0	+	0	+	+	+	+	Cs(a-)^s	3	+	++
4	ccD.ee	Ror	70117500459	+	0	+	0	+	0	0	+	0	+	+	0	+	0	0	+	+	+	0	+	0	+	0	+	0	+	0	+	0	Ch(a+^{w})^s	4	—	—
5	Ccddee	r´r	70317100562	0	+	+	0	+	0	0	+	0	+	0	+	0	+	0	+	+	+	0	+	0	+	0	+	0	+	+	+	0	Yk(a-)$^{+s}$	5	—	—
6	ccddEe	r´´r	70317120199	0	0	+	+	+	0	0	+	0	+	0	+	0	+	0	+	$+^{vs}$	0	+	0	+	+	0	+	0	+	+	+	+	Yk(a-)$^{+s}$, Ch(a+^{w})^s, Cs(a-)^s	6	+	++
7	ccddee	rr	70117360574	0	0	+	0	+	0	+	0	0	+	+	+	0	+	0	+	+	+	0	0	+	+	0	+	0	+	+	+	+	Lu14+$^-$ Yk(a+^{w})^s	7	+	++
8	ccddee	rr	70417341437	0	0	+	0	+	0	0	+	+	+	+	0	+	0	+	0	0	+	0	+	0	+	0	+	0	+	+	0		8	—	—
9	ccddee	rr	70417393160	0	0	+	0	+	0	0	+	0	+	+	0	+	+	0	+	$+^s$	0	+	0	+	+	+	+	0	+	+	0		9	++	+++
10	ccddee	rr	70217220326	0	0	+	0	+	0	0	+	0	+	0	+	+	0	0	+	0	0	+	+	0	+	0	+	0	+	+	+	Yt(b+)$^-$ Kn(a+^{w})^s	10	+	++
11	ccddee	rr	70317300076	0	0	+	0	+	0	0	+	0	+	+	0	0	+	0	0	+	+	0	+	0	+	0	+	0	+	0	+	Cs(a+^{w})^s Yk(a+^{vw})^s	11	++	+++
	Patientenzellen Patient´s cells																														Patientenzellen Patient´s cells		—	nt

Figure 3: Antibody identification of a patient`s plasma containing anti-Au^b and anti-Lu^a