

## **A BLOOD BANKER'S NIGHTMARE**

Case study by Jim Perkins, M.D. (©2009)

At 6 pm (1800) the blood bank pages you. The technologist reports that there is an 81 year old man in the emergency room with a hemoglobin of "4". The patient is group O, Rh positive. The antibody screen is 2+ to 3+ positive at AHG phase with all 3 screening cells. The DAT is also positive, 2+ with anti-C3 and polyspecific AHG and 1+ with anti-IgG.

### **WHAT IS YOUR IMPRESSION?**

### **WHAT DO YOU WANT TO KNOW?**

### **WHAT DO YOU WANT TO DO NEXT?**

You call the ED and speak with the attending physician. He relates that the patient came in complaining of fatigue and generalized weakness - feeling "wobbly" - and had noticed slight jaundice. The patient also had noted an increase in his usual back pain, which was concentrated in the right flank. The physician relates that the patient has a past history of coronary artery bypass grafting and repair of an abdominal aortic aneurysm. His hemoglobin is 4.5, but nasogastric aspiration and a stool guaiac did not show signs of bleeding.

### **WHAT COUNSEL SHOULD YOU GIVE THE PHYSICIAN?**

You tell the emergency room physician that it looks like the patient has a warm autoantibody, that there is a significant (up to 30%) likelihood that there is an underlying alloantibody, that ruling out an underlying clinically significant alloantibody could take many hours, and that, in the absence of a workup, if hemolysis occurs after transfusion it will be difficult to determine if it was the work of an autoantibody or an alloantibody. Moreover, you suggest that the patient may have warm autoimmune hemolytic anemia (WAIHA) and that they immediately start high dose steroids and intravenous immune globulin, and you ask them to send you 4 EDTA samples.

The ED physician gulps and says that the patient is stable enough to wait for 4 hours for compatibility testing.

### **WHAT SHOULD YOU ASK THE LABORATORY TO DO?**

You ask the laboratory to immediately perform antigen phenotyping, to run a panel, to start an autoadsorption, and to screen their group O, Rh negative units for K and Jk<sup>a</sup>.

The lab calls you again to tell you that the patient's primary physician has arrived and is demanding immediate transfusion. You call the emergency room and this physician tells you the patient is in shock; the BP dropped to 80 systolic, improved with reverse Trendelenburg position, the skin is mottled, and the creatinine has doubled since 12 days earlier. Moreover, the physician tells you that the patient had a normal hemoglobin 12 days ago and that he is concerned that the patient is bleeding from his abdominal aorta.

You again give your diagnosis, recount the risks, and ask if they can wait 20 minutes for the antigen typed units. He says he'll wait 20 minutes. You reiterate that the patient should get high dose steroids and IVIG, and suggest that, if possible, the units should be infused slowly.

At 1845 the blood bank issues a unit of group O, Rh, K, and Jk<sup>a</sup> negative RBCs to the patient in the ICU. There are 3 more such units available.

Somewhat later you call the ICU for a status report. Transfusion has proceeded somewhat slowly because of the multiple agents being administered and a relative lack of IV access. In addition, an abdominal CT scan was done, which ruled out bleeding. The patient is now requiring pressor support for blood pressure maintenance.

### **COULD THE PATIENT BE HAVING A HEMOLYTIC REACTION?**

## CAN YOU RULE IT OUT?

You request that a specimen be drawn and sent to the blood bank. After clotting the tube is centrifuged and inspected; the serum does not show any hemoglobinemia in comparison to the pretransfusion specimen. Concurrently, the laboratory has completed the patient's extended phenotype, showing the patient to be C, K, Jk<sup>a</sup>, and S negative.

Nonetheless, because the patient has progressive hypotension the resident stops the transfusion with 50 cc to go on suspicion of a transfusion reaction.

## WHAT NEEDS TO BE DONE NOW?

You tell the resident that there is no hemolysis, and that he can transfuse the available units as fast as needed.

Three more units of RBCs are infused between 2335 and 0530 and the 5<sup>h</sup> unit is started at 0700. Unfortunately, by midmorning the patient's pupils are fixed and dilated. The patient lived for 9 days without regaining consciousness.

## LABORATORY DATA

### General laboratory values

	Day -11	Day 0, 1524	Day 0, 2204	Day 1, 1054	Day 2, 0503	Day 2, 1623
Hgb	12.5	4.5	5.5	10.4		
Hct	36.7	13.6	16.4	29.6		
WBC	5.4	9.5	10.8	8.5		
T/DBILI	1.6/0.3	2.2/0.5				3.6/2.8
LDH	170					2230
Creatinine	2.8	5.4	5.5	5.4		5.9
CPK	78	245	336	487	1530	1157
CPK-MB (nml <4.7)		1.6	3.6	13.9	25.7	
Myoglobin (< 110)		818	> 1000	> 1000	> 1000	
SGOT (AST)		115				3120
SGPT (ALT)	6	85				2291
Amylase		110				859
pH			7.15	7.4	7.47	
pO <sub>2</sub>			530	90	65	
pCO <sub>2</sub>			22	22	24	

## Immunhematologic Testing

### ABO and Rh Typing

	Anti-		Test Cells		Anti-			Interp.	
	A	B	A1	B	D	Du	Cont	ABO	Rh
IS	0	0	4+	4+	3+				

### Antibody screen

	IS	30'37°	AHG	CC
OI	0	0	2+	
OII	0	0	3+	
OIII	0	0	2+	
Auto				

### Direct Antiglobulin Test

	POLY	IgG	C3
AHG	2+	1+	2+
CC			

### Blood group phenotype

C	E	c	e	M	N	S*	s*	P1	Le <sup>a</sup>	Le <sup>b</sup>	K	Fy <sup>a*</sup>	Fy <sup>b*</sup>	JK <sup>a*</sup>	JK <sup>b*</sup>	Sc1*
0	+	+	+	+	0	0	+	+	0	+	0	+	+	0	+	+

\*Cells glycine-EDTA treated to a negative DAT

Initial Antibody Identification Panel

Lot #95360		Rh system						Kell						Duffy		Kidd		Lewis		P	MNSs					Lutheran		Xg	Other Typings	4 drops raw serum				Eluate
Cell	Rh	D	C	c	E	e	V	K	k	Kp <sup>a</sup>	Kp <sup>b</sup>	Js <sup>a</sup>	Js <sup>b</sup>	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Le <sup>a</sup>	Le <sup>b</sup>	P1	M	N	S	s	Lu <sup>a</sup>	Lu <sup>b</sup>	Xg <sup>a</sup>	Cell		IS	37°, 30'	>IgG	>IgG	
1	rr	0	0	+	0	+	0	+	+	0	+	0	+	0	+	+	+	0	0	+	0	+	+	+	0	+	+	1	0	0	3+	1+		
2	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	0	+	+	+	0	+	0	+	+	+	+	+	+	2	0	0	1+	1+		
3	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	+	0	+	+	0	+	+	+	0	+	0	+	0	3	0	0	3+	1+		
4	r'r	0	+	+	0	+	0	0	+	0	+	0	+	+	+	+	+	+	0	+	0	+	+	+	0	+	0	4	0	0	3+	1+		
5	r''r	0	0	+	+	+	0	0	+	0	+	0	+	+	+	+	0	0	+	0	+	+	+	+	0	+	+	5	0	0	2+	1+		
6	R1wR1	+	+	0	0	+	0	0	+	0	+	0	+	0	w	0	+	0	+	0	+	+	+	0	0	+	+	6	0	0	vw+	1+		
7	Ro	+	0	+	0	+	0	0	+	0	+	0	+	0	0	+	+	0	0	+	+	0	0	0	0	+	+	Uvar	7	0	0	2+	1+	
8	R2R2	+	0	+	+	0	0	+	+	0	+	0	+	+	+	0	+	0	+	0	+	0	+	+	0	+	+	8	0	0	3+	1+		
9	RzR1	+	+	0	+	+	0	0	+	0	+	0	+	+	+	+	+	0	+	+	0	+	0	+	+	+	+	9	0	0	3+	1+		
10	Ro	+	0	+	0	+	0	0	+	0	+	0	+	0	0	+	0	+	+	+	+	+	+	+	0	+	+	Go(a+)	10	0	0	2+		
11	R1R1	+	+	0	0	+	0	0	+	0	+	0	+	+	+	+	+	+	0	+	+	0	0	+	0	+	w	11	0	0	3+			
12	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	0	+	0	0	+	0	+	+	+	+	0	+	+	12	0	0	3+			
13	r''r	0	0	+	+	+	0	0	+	0	+	0	+	+	+	+	+	0	+	+	+	+	+	0	0	+	0	13	0	0	2+			
14	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	w	+	0	0	+	w	+	+	+	0	0	+	0	Vel-	14	0	0	2+		
15	Ro	+	0	+	0	+	0	0	+	0	+	+	+	0	0	0	+	+	0	+	0	+	0	+	0	+	+	Co(b+)	15	0	0	2+		
16	R1R2	+	+	+	+	+	0	+	0	0	+	0	+	+	+	+	+	0	+	+	+	+	+	+	0	+	+	16	0	0	1+			
Patient																												AC						

Panel with 2x warm-autoadsorbed serum (tube testing: 2 drops serum, 60" incubation)

		Rh system						Kell						Duffy		Kidd		Lewis		P	MNSs					Lutheran		Xg	Other Typings	Cell	Ads serum; m >IgG
Cell	Rh	D	C	c	E	e	V	K	k	Kp <sup>a</sup>	Kp <sup>b</sup>	Js <sup>a</sup>	Js <sup>b</sup>	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Le <sup>a</sup>	Le <sup>b</sup>	P1	M	N	S	s	Lu <sup>a</sup>	Lu <sup>b</sup>	Xg <sup>a</sup>				
3	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	+	+	0	+	0	w	+	0	+	0	0	+	0		3	1+	
5	r'r	0	0	+	+	+	0	0	+	0	+	0	+	+	+	0	+	0	+	+	0	+	0	+	0	+	0		5	1+	
6	R1wR1	+	+	0	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	0	+	+		6	2+	
8	R2R2	+	0	+	+	0	0	+	+	0	+	0	+	+	+	0	+	+	0	+	0	+	0	+	0	+	+		8	1+	
11	R1R1	+	+	0	0	+	0	0	+	0	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	+	+		11	2+	
14	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	0	0	+	0	+	0	0	+	0	+	0	+	+	-	14	1+	

Special testing

	Untreated RBCs	2X Warm ads serum	Peg ads serum, 4 drops	Ficin tx'd RBCs	AET tx'd RBCs	Pronase tx'd RBCs	Day -11 serum
	>1gG	>1gG	>1gG	>1gG	>1gG	>1gG	>1gG
OI	2+	1+	vw+	2+	2+	0 <sup>√</sup>	1+
OII	3+	1+	vw+	2+	2+	0 <sup>√</sup>	1+
OIII	1+	vw+	0	w+	w+	0 <sup>√</sup>	w+
Auto							1+*

\*Autocontrol with chloroquine treated RBCs from day 0 specimen

Titer

Saline-AHG titer	Dilution					
	1	1:2	1:4	1:8	1:16	1:32
OI	2+	1+	w+	vw+	0	0
OII	2+	2+	w+	vw+	0	0

OIII	1+	w+	vw+	0	0	0
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Panel of cells lacking high frequency antigens

		Rh system						Kell						Duffy		Kidd		Lewis		P	MNSs				Lutheran		Xg	Other Typings	Cell	Ads seru;m
Cell	Rh	D	C	c	E	e	V	K	k	Kp <sup>a</sup>	Kp <sup>b</sup>	Js <sup>a</sup>	Js <sup>b</sup>	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Le <sup>a</sup>	Le <sup>b</sup>	P1	M	N	S	s	Lu <sup>a</sup>	Lu <sup>b</sup>	Xg <sup>a</sup>			PEG, >IgG
1	R1r	+	+	+	0	+		0						+	0	+	+				0	+	0	+				Di <sup>b-</sup>	1	1+
2	R1R2	+	+	+	+	+		0	+	0	+	0	+	+	0	+	+	0	0	0	0	+	0	+	0	+	+	Tj <sup>a-</sup>	2	2+
3	R1R1	+	+	0	0			0						+	+	0	0	+	0		+	0	0				Jk <sup>a-b-</sup>	3	2+	
4	rr	0	0	+	0	+		+	+	0	+			+	+	+	+	+	0	0	+	+	0	+	0	+	Lan-	4	1+	
5	R1r	+	+	+	0	+		0	+	0	+	0	+	0	+	+	+	0	0	+	+	0	0	+	0	+	0	O <sup>h</sup> , Co <sup>b-</sup>	5	2+
6	R1R1	+	+	0	0	+		0						+	+	+	0	0	+	+	+	0	+	+			Ge-1-2-3	6	1+	
7	R1r	+	+	+	0	+		0	+	0	+	0	+	0	+	0	+	0	+	+	+	0	+	+	0	0	+	Lu <sup>a-b-</sup>	7	w+
8	R1r	+	+	+	0	+		0	+	0	+	0	+	+	+			+	0	+	+	+	+	+	0	+	+	Co <sup>a-</sup>	8	2+
9	rr	0	0	+	0	+		0	+	0	+	0	+	+	0	+	0	+	0	+	+	+	0	+	0	+	+	Sc:-1,2	9	0
10	R2r	+	0	+	+	+	0	0	+	0	+	0	+	+	+			0	+	+	+	+	0	+	0	0	+	Co <sup>b-</sup>	10	2+
11	R1r	+	+	+	0	+		0	+		+		+	0	0	+	+	0	+	+	0	+	+	+	0	0			11	2+
12	R1r	+	+	+	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	+	+	0	+	+	0	0			12	2+
13	R1r	+	+	+	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	+	+	0	+	+	0	0	+	Co <sup>b-</sup>	13	1+
14	rr	0	0	+	0	+		0	+	0	+	0	+	+	0	+	0	+	0	+	0	+	0	+	0	+	+	Sc:-1,2	14	0
15	rr	0	0	+	0	+		0						+	0	+	0	+	0		0	+	0	+			Sc:-1,2	15	0	
16	R1R2	+	+	+	+	+		0	+	0	+			+	+	0	+	0	+	0	0	+	+	0	+		Sc:-1,2	16	0	

Lot #34559		Rh system						Kell						Duffy		Kidd		Lewis		P	MNSs					Lutheran			Xg	Other Typings	Cell	IS	30', RT	4°C
Cell	Rh	D	C	c	E	e	V	K	k	Kp <sup>a</sup>	Kp <sup>b</sup>	Js <sup>a</sup>	Js <sup>b</sup>	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Le <sup>a</sup>	Le <sup>b</sup>	P1	M	N	S	s	Lu <sup>a</sup>	Lu <sup>b</sup>	Xg <sup>a</sup>							
1	<b>R1R1</b>	+	+	0	0	+	0	0	+	0	+	0	+	+	+	0	+	+	0	0	+	0	0	+	0	+	+		1	0	1+	4+		
2	<b>R1wR1</b>	+	+	0	0	+	0	+	+	0	+	0	+	0	+	+	+	0	+	+	0	+	0	+	0	+	0		2	0	1+	4+		
3	<b>R2R2</b>	+	0	+	+	0	0	0	+	0	+	0	+	+	+	0	+	0	+	+	+	0	+	+	0	+	+		3	0	2+	4+		
4	<b>Ror</b>	+	0	+	0	+	+	0	+	0	+	+	+	0	0	+	+	w	+	+	+	0	0	0	0	+	+		4	0	1+	4+		
5	<b>r'r</b>	0	+	+	0	+	0	0	+	0	+	0	+	0	+	+	0	0	+	+	+	0	+	0	0	+	+		5	0	2+	4+		
6	<b>r''r</b>	0	0	+	+	+	0	0	+	0	+	0	+	+	0	0	+	0	+	+	+	+	0	+	0	+	+	Co(b+)	6	0	1+	4+		
7	<b>rr</b>	0	0	+	0	+	0	+	+	0	+	0	+	0	+	+	0	0	+	+	+	0	+	+	0	+	0	Bg(a+)	7	0	2+	4+		
8	<b>rr</b>	0	0	+	0	+	0	0	+	0	+	0	+	+	0	+	0	0	+	+	+	0	0	+	0	+	+		8	0	2+	4+		
9	<b>rr</b>	0	0	+	0	+	0	0	+	0	+	0	+	+	+	+	+	0	0	+	0	+	0	+	0	+	+		9	0	1+	4+		
10	<b>rr</b>	0	0	+	0	+	0	0	+	0	+	0	+	+	+	+	0	+	0	0	+	+	0	+	0	+	+		10	0	1+	4+		
11	<b>R1R1</b>	+	+	0	0	+	0	0	+	0	+	0	+	+	+	0	+	0	+	+	+	0	+	+	0	+	0	Bg(a+)	11					
O Cord																													0	w+				
Patient																												AC	0	w+	4+			

**FINAL IMMUNOHEMATOLOGIC DIAGNOSIS:  
WARM AUTOIMMUNE HEMOLYTIC ANEMIA DUE TO AUTOANTI-SC1.**