

ERYTHROBLASTOSIS FETALIS WITHOUT AN OBVIOUS CAUSE
Case Study by Jim Perkins, MD (©2010)

A 31 year old pregnant woman at 41 weeks, 2 days gestation was admitted to the hospital for induction of labor because of her post-date status and previous caesarian section. She had been pregnant 3 times before. The first two pregnancies ended with spontaneous abortions at 5 and 8 weeks. Her third pregnancy yielded twins, one born by a normal, spontaneous vaginal delivery and one by caesarian section. The mother had been taking aspirin for methylenetetrahydrofolate reductase deficiency, but her pregnancy was uneventful. She was group O, Rh positive with a negative blood group antibody detection test on routine prenatal laboratory testing.

As labor progressed the amniotic fluid appeared meconium stained prompting a request for a neonatologist to attend the delivery, but she proceeded to deliver vaginally. The 8lb,13oz (4025 gm) male infant's umbilical cord was around his neck, knotted so tightly that it could not be reduced and had to be cut. He had initial respiratory difficulty with Apgar scores of 4 at 1 minute and 9 at 5 minutes and was brought to the neonatal intensive care unit.

A blood count demonstrated fetal anemia with hemoglobin (hgb) 8.1g/dL, hematocrit (hct) 24.4 and reticulocytosis of 12 % (215,000/ μ L). The WBC count was 48,400/ μ L, but examination of the blood smear demonstrated 143 nucleated RBCs for every 100 white cells. Soon thereafter routine cord blood testing (cord testing is performed on all infants of group O mothers at our institution) revealed the infant to be O positive with a 4+ positive direct antiglobulin test (DAT). A bilirubin level obtained 3 hours after delivery was significantly elevated at 9.9 gm/dL. Phototherapy was immediately initiated, as was serologic investigation of the mother's "Blood Bank Hold" specimen (blood sample submitted to the blood bank on admission in case transfusion was unexpectedly needed) with the following results.

ABO and Rh Typing (Maternal specimen)

<A	<B	A1 cells	B cells	6% alb	<D	<D/AHG	CCC	Interp
0	0	4+	4+		4+			O pos

Antibody Screen (Maternal specimen)

	Gel
OI	0
OII	0

Direct Antiglobulin Test

	Poly	IgG	<C3
AHG	0		
CCC	2+		

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Intial panel (Maternal specimen)

Lot# VRA138	Rh system	Kell						Duffy		Kidd		Xg	Lewis		MNSs				P	Lutheran		Other										
Cell	Rh	D	C	E	c	e	V	K	k	Kp ^a	Kp ^b	Js ^a	Js ^b	Fy ^a	Fy ^b	Jk ^a	Jk ^b	Xg ^a	Le ^a	Le ^b	S	s	M	N	P1	Lu ^a	Lu ^b	Typings	Cell	Gel		
1	R1wR1	+	+	0	0	+	0	0	+	0	+	0	+	0	+	0	0	0	+	0	+	+	+	+	0	0	+	C ^w	1	0		
2	R1R1	+	+	0	0	+	0	+	+	0	+	0	+	+	+	0	+	0	0	+	0	+	+	0	+	0	+		2	0		
3	R2R2	+	0	+	+	0	0	0	+	0	+	0	+	0	+	0	+	0	0	+	0	+	+	+	+	0	+		3	0		
4	Ror	+	0	0	+	+	0	0	+	0	+	0	+	0	0	+	+	+	0	0	0	+	0	+	+	0	+		4	0		
5	r ⁺ r	0	+	0	+	+	0	0	+	0	+	0	+	0	0	+	+	0	0	0	0	+	0	+	+s	0	+		5	0		
6	r ⁺ r	0	0	+	+	+	0	0	+	0	+	0	+	0	+	+	+	+	0	+	0	+	0	+	+s	0	+		6	0		
7	rr	0	0	0	+	+	0	+	+	0	+	0	+	0	+	+	0	+	0	+	+	+	+	+	+	0	+		7	0		
8	rr	0	0	0	+	+	0	0	+	0	+	0	+	+	0	+	0	+	+	0	+	+	+	+	0	0	+		8	0		
9	rr	0	0	0	+	+	0	0	+	0	+	0	+	0	+	0	+	+	0	+	+	0	+	0	0	0	+		9	0		
10	rr	0	0	0	+	+	0	+	+	0	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0	0	+		10	0		
11	R1R1	+	+	0	0	+	0	0	+	0	+	0	+	0	+	0	+	+	0	+	+	0	+	+	+	0	+		11	0		
Patient																												AC				

QUESTIONS:

1. How might you explain this infant's positive DAT and apparent hemolytic disease?

2. What test should be performed next? Explain your answer.

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Selected cells, LISS IAT (in- and outdated panels)

Cell	Special type	Rh system					Kell				Duffy		Kidd		Xg	Lewis		MNSs				P	Lu	LISS IAT				
		D	C	E	c	e	K	k	Kp ^a	Js ^a	Fy ^a	Fy ^b	Jk ^a	Jk ^b	Xg ^a	Le ^a	Le ^b	S	s	M	N	P1	Lu ^a	Cell	IS	37°	AHG	CC
1	He+	+	0	0	+	+	0	+	0	0	0	+	0	+	+	0	+	+	0	+	+	+	+	1	0	0	0	2+
2	Dantu +	0	0	0	+	+	0	+	0	0	0	+	+	+	0	0	0	+	+	+	+	+	0	2	0	0	0	2+
3	Mg+, Lu ¹⁴	+	+	0	0	+	0	+	0	0	+	+	+	+	+	0	+	+	+	0	+	0	3	0	0	0	2+	
4	Vw+	0	0	+	+	+	+	+	0	0	0	+	+	0	0	+	0	+	0	+	0	+	+	4	0	0	0	2+
5	Mur+	+	0	0	+	+	0	+	0	0	0	+	0	+	0	+	0	+	+	+	+	+	0	5	0	0	0	2+
6	Mt ^a +	0	0	0	+	+	+	+	0	0	+	0	+	+	+	0	+	+	+	+	+	+	0	6	0	0	0	2+
7	VS+	0	+	0	+	+	0	+	0	0	0	+	+	0	0	+	0	+	+	+	+	+	0	7	0	0	0	2+
8	Wr ^a +	+	+	0	0	+	0	+	0	0	+	+	+	+	+	0	0	+	0	+	+	+	0	8	0	0	3+	NT
Confirmatory cells from frozen rare cell inventory																												
9	Wr ^a +	+	+	+	+	+	+	+	0	0	+	+	0	+	0	+	0	0	+	+	+	+	+	9	0	1+	4+	NT
10	Wr ^a +	0	+	0	+	+	0	+	0		+	+	+	0	+	+	0	+	+	+	0	+		10	0	1+	4+	NT
																								AC				

Titration (IAT with 2 drops plasma, 1 drop saline-suspended RBCs, 30 minute incubation at 37°)

ANTIBODY: Anti-Wr ^a					EDC: NA					Tech: PDE					Date tested: Day 2				
Sample dilution, Reaction strength at AHG phase:																			
Sample date:	1	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	Titer				
Old:																			
New	NT	4+	4+	3+	2+	1+	1+	0	0	0	0	0			64				
Cell type: Paternal					Manufacturer: NA					Lot number: NA					Comment:				

QUESTIONS:

5. What is the definitive immunohematologic diagnosis? Discuss the nature of the causative antibody and target antigen.

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6. What are the principles of treatment for this neonate?

FOLLOW-UP/CLINICAL COURSE:

The time course of the patient's bilirubin levels and hematocrit are shown in the graphs below.

The bilirubin peaked at 16.4 g/dL on day 3, never reaching the threshold for exchange transfusion. Intensive phototherapy was continued for 7 days. The hematocrit reached a nadir of 17 on day 6 and the infant was given two aliquots (noted by arrows) of group O, irradiated, leukocyte filtered RBCs which were crossmatch compatible with his plasma and maternal plasma. The aliquot volumes were 63 and 42 mL, or approximately 15 and 10 mL/kg respectively. The bilirubin level declined significantly thereafter, and the infant was discharged on its 7th day of life.

