

# Therapeutic Monoclonal Antibodies and Blood Bank Mitigation Strategies

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The need is constant.  
The gratification is instant.  
Give blood.™



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- I have no real or apparent conflict of interest or other relationships related to the content of this presentation.
- There is no off-label and/or investigational use of products discussed in this presentation.
- I have no relevant financial relationship to disclose.

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## Objectives

- Understand the physiopathological functions of specific monoclonal antibodies.
- Understand how these mechanisms cause interference in pre-transfusion testing.
- Become aware of methods and techniques employed to mitigate these effects.

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## Definition of an Antibody

- An antibody is a protein produced by the immune system in response to foreign antigens.
- Most antibodies produced from B lymphocytes as part of normal immune functions are polyclonal and have slightly different specificities for the target antigen.
- Monoclonal antibodies (mAbs) are man-made antibodies synthesized from cloned immune cells by introducing human genes that produce antibodies into mice or other suitable mammal.
- The monoclonal antibody binds to one specific antigen type.

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## Difference Between Monoclonal and Polyclonal antibodies

- Monoclonal antibodies differ from polyclonal antibodies in the following ways:
  - mAbs are homogenous preparation of antibodies
  - Every antibody is identical
  - Same antigen recognition site
  - Identical affinity for the antigen
  - Identical biological interactions

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## Production of Monoclonal Antibodies

- Immunize an animal (typically a mouse)
  - Earliest method available
  - Risk of developing antibody to mouse antibody sequence
  - If a human-anti-mouse antibody develops they cannot receive continued dosage of the mAb or any other mAb produced in this manner
- Obtain existing antibody
  - Existing antibodies can be isolated from a patient
- Screen a library
  - Use a variety of antibodies to isolate the target antigen
- Humanized mAbs
  - mAbs originally derived from non-human species can be manipulated to make them similar to the human sequence

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## Therapeutic Monoclonal Antibody Development

- The World Health Organization (WHO) is responsible for the nomenclature
- After 1990 all therapeutic mAbs names end in "mab"
- Over 100 mAbs have been approved by the FDA as drug therapy
- To date the WHO has provided over 500 mAbs names

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## Types of Monoclonal Antibodies

- Naked Monoclonal Antibody
  - These mAbs work by themselves and bind to specific proteins
- Conjugated Monoclonal Antibodies
  - These mAbs are joined to a chemotherapy agent or radioactive material
  - The mAbs acts as a homing device to deliver the chemotherapy or radioactive material to the cancer cells
  - Sometimes called Radioimmunotherapy
- Bi-specific monoclonal antibodies
  - Made up of two distinct mAbs to bring cancer cells and immune cells together

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## Mechanism of action for mAbs

- Target is cell surface antigen
  - May block receptors to prevent cell proliferation or survival
  - May promote immune destruction of cells
- Target is a plasma protein or drug
  - Antigen binding and sequestration from the normal binding partners
  - Drugs are bound with the mAb and neutralized
- Target is an infectious organism
  - Targets protein on the surface of the organism, thus neutralizing from entering cells

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## Indications for Therapeutic Monoclonal Antibodies

- Blood cancers
- Solid tumors
- Autoimmune disorders
- Alzheimer's disease
- Infectious organisms
- Drug reversal
- Asthma
- Allograft rejection

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## Examples of FDA Approved Therapeutic Monoclonal Antibodies

Antibody	Brand name	Target	Targets Disease
Adalimumab	Humira	TNF	Rheumatoid Arthritis
Bezlotoxumab	Zinplava	Clostridium difficile toxin B	Prevent recurrence of infection
Daratumumab	Darzalex	CD38	Multiple Myeloma
Evolocumab	Repatha	PCSK9	Hypercholesterolemia
Idarucizumab	Prazbind	Dabigatran	Emergency reversal of anticoagulant
Ixekizumab	Taltz	IL17A	Plaque psoriasis
Mepolizumab	Nucala	IL5	Severe asthma
Nivolumab	Opdivo	PD-1	Metastatic melanoma/lung carcinoma
Trastuzumab	Herceptin	HER2	Metastatic breast cancer
Rituximab	Rituxan	CD20	B-cell non-Hodgkins lymphoma
Vedolizumab	Entyvio	Integrin receptor	Ulcerative colitis/Crohn's disease
Basiliximab	Simulect	IL2RA	Prophylaxis of acute organ rejection in renal transplant
Ibalizumab-uiyk	Trogarzo	CD4	HIV

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## Monoclonal Therapies Known to Cause Interference with Pre-transfusion Testing

- Daratumumab (Darzalex™ or DARA) is an anti-CD38 mAb
- Hu5F9-G4 (Camellia) is an anti-CD47 mAb
- Checkpoint inhibitors
  - Anti-CTLA-4
    - Ipilimumab
    - Tremelinunab
  - Anti-PD-1
    - Nivolumab
    - Pembrolizumab
    - Pidilizumab
  - Anti-PD-L1
    - Atezolizumab
    - Durvalumab

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## DARA Mitigation Techniques

- 1% Trypsin
  - Enzyme cleaves CD38 from cell surface
  - Does not denature Kell antigens
  - Does denature many other common blood group antigens
- Cord blood cells
  - Cord cell lack sufficient CD38 to react with the antibody
- Lu (a-b-) *IN(LU)* Dominant rare red cells
  - May be helpful to rule out antibodies to antigen denature or not detected with other techniques
- Reports of weak to negative reactions with African American Fy(a-b-)

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## Dara Mitigation Techniques

- Samples from other ABO compatible patients receiving DARA
  - These cells have a reduced expression of CD38
  - May be helpful to rule out specificities denatured by other techniques
- Capture R/solid phase
  - Some weak antibodies may fail to react with this platform
  - Advantage- no blood group antigens are denatured
- Soluble CD38
  - Can neutralize anti-CD38 in the sample, no antibodies missed due to denaturation
  - Expensive, short shelf life, high failure rate

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## Additional Anti-CD38 Therapeutics

- Additional anti-CD38 clinical trials are under way for treatment of amyloidosis, CLL, AML, ALL, Hodgkin and non-Hodgkin lymphoma and systemic lupus or other autoimmune diseases
  - DARA (Janssen Biotech)
  - MOR202 (MorphoSys)
  - Isatximab (Sanofi-Aventis)
  - TAK-079 (Takeda)

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## CD47 Molecule

- Is a transmembrane glycoprotein that is widely expressed on human cells and tissues.
- Is overly expressed on some forms of tumor cells.
- Is expressed on red blood cells and platelets.
- Sends a signal "don't eat me" to macrophages.
- Binds to signal-regulatory protein  $\alpha$  (SIRP $\alpha$ ) on macrophages and regulated phagocytosis.
- Is also involved in cellular proliferation, adhesion and migration.
- The amount of CD47 on RBCs and platelets diminish over time and allow macrophages to destroy and remove aging cells.
- CD47 is encoded by the CD47 gene which is located on chromosome 3.
- Elevated CD47 expression has been correlated with poor prognosis in various cancer types.
- Linked to the cytoskeleton with Rh system.
- D- - have significantly reduced levels of CD47 and Rh<sub>null</sub> cells nearly undetectable CD47

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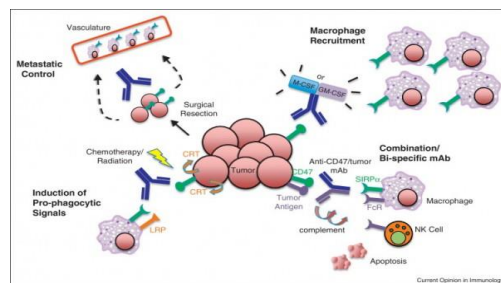
## Anti-CD47 Mechanism of Action

- Several therapeutic anti-CD47 monoclonal and CD47-blocking fusion proteins are in clinical trials.
- Anti-CD47 (Hu5F9-G4, Camellia™) is a therapeutic monoclonal antibody in clinical trials for use with patients with hematologic or solid malignancies.
- The antibody blocks the CD47 "do not eat me" signal and allows for phagocytosis by macrophages.
- This blocking mechanism also occurs with red cells and platelets and may result in anemia and thrombocytopenia following drug therapy.
- Anti-CD 47 (Hu5F9-G4) is a monoclonal IgG4 antibody.

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## Anti-CD47 Mechanism of Action



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## Hu5F9-G4 Interference in Pre-transfusion Testing

- Plasma reactivity (3-4+) in all test phases, including immediate spin, room temperature, 37C and IAT. Resulting in inference of:
  - ABO grouping
  - Antibody detections
  - Antibody identification
  - Compatibility testing
  - Phenotyping
  - Platelet crossmatch
- This interference can be seen as soon as 1 hour post infusion.
- DAT may be negative or weakly positive, however eluates are strongly reactive.
- Spontaneous agglutination may also be present causing false positives in ABO and antigen typing.



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## Hu5F9-G4 Interference in Pre-transfusion Testing

- Warm washing or EGA treatment of cells is not successful in avoiding spontaneous agglutination.
- Ficin, papain, trypsin, α-chymotrypsin, 0.2M DTT or W.A.R.M. treated cells fail to remove the reactivity.
- Samples are reactive with cord blood.
- Circulating anti-CD47 plasma titers can range from 4096 up to 16,384.
- PEG adsorptions are not effective, as they precipitate plasma antibodies.
- Multiple adsorptions with Immucor HPC (Human Platelet Concentrate) reduced reactivity, however may not eliminate reactivity.
- Capture R solid phase platelet testing will be reactive in all test wells.



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## Hu5F9-G4 Mitigation Techniques

- Before treatment with Hu5F9-G4
  - A baseline ABO/Rh, antibody screen and, antibody identification be performed
  - A phenotype or genotype be obtained
- Multiple allogeneic adsorptions can reduce or even eliminate the reactivity in some patients.
- Sample may be non-reactive at IAT with Immucor monoclonal Gamma-clone Anti-IgG which does not contain IgG4 subclass.
- Avoid IS and 37C phase of testing.
- Multiple adsorptions with pooled single donor platelets may also reduce or eliminate reactivity.
- May avoid interference with platelet testing using the PakPlus assay.



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## Checkpoint Inhibitors

- These drugs act to upregulate the immune response to tumor cells by inhibiting T cell autoregulation.
- They are associated with immune-related adverse events due to the loss of self-tolerance.
- Used in patients with advanced cancers.
- This class of drugs may be associated with:
  - development of autoantibodies
  - immune-mediated cytopenia
  - pure RBC aplasia
  - aplastic anemia



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## Case Study 1

- The Immunohematology Reference Laboratory (IRL) received a submission from a customer requesting antibody identification.
- Sample is from:
  - male
  - age 65
  - previously transfused 6 months ago
  - presenting with anemia
  - requesting 2 STAT units for transfusion
  - all cells reactive at IAT



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## Case Study 1 Routine Testing

Interp.	Red Cell Type					Rh			Serum Type				
	Anti-A	Anti-B	Anti-D	A <sub>1</sub> cells	B cells	Anti-D	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Lu <sup>a</sup>	Lu <sup>b</sup>	IS
<b>A Positive</b>	<b>4+</b>	<b>0</b>	<b>4+</b>	<b>0</b>	<b>3+</b>								

Blood Group System	Rh					MNSs		P1	Lewis		Kell		Duffy		Kidd		Lutheran		IS	US/37	US/IAT	CC	
	D	C	E	c	e	M	N	S	S	P1	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>					Lu <sup>a</sup>
1 R <sub>1</sub> R <sub>2</sub>	+	+	0	0	+	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	0	2+	
2 R <sub>1</sub> R <sub>2</sub>	+	+	0	0	0	+	+	0	+	0	0	0	0	+	+	0	0	+	0	0	0	2+	
3 rr	0	0	0	+	+	+	+	0	+	+	+	+	+	+	0	+	+	0	0	0	0	2+	
Auto Control																				0	0	0	2+

Unit Number	IS	US/37	US/IAT	Unit ABO			Special Requirements	Interpretation
				Anti-A	Anti-B	Anti-D		
W2020191234500X	0	0	2+	4+	0	4+	A+	Incompatible

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### Case Study 1 Antibody Identification Testing

Cell	D	C	E	e	C <sup>w</sup>	K	k	Fy <sup>a</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Le <sup>a</sup>	P <sub>1</sub>	M	N	S	s	Lu <sup>a</sup>	Lu <sup>b</sup>	Rh	Ir	Utricular	LSS/AT
1	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	+	0	+	0	0	2+
2	+	0	+	+	0	0	0	+	+	+	+	0	+	0	+	0	0	0	+	0	0	2+
3	0	+	0	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0	+	0	0	2+
4	0	0	+	+	0	+	+	0	+	+	+	0	+	+	0	0	+	0	+	0	0	2+
5	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
6	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
7	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
8	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
9	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
10	0	0	0	+	+	0	0	+	+	0	+	+	0	+	+	0	+	0	+	0	0	2+
11	+	0	0	+	+	0	0	+	+	0	+	+	0	0	0	0	+	0	+	0	0	2+

### Case Study 1 Additional Testing

	Rh		MNSs				P	Lewis		Kell	Duffy	Kidd		LSS/AT						
	D	C	E	e	M	N	S	s	P <sub>1</sub>	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>			
1	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	PM Cell	2+
2	+	+	0	0	+	+	+	+	0	+	0	+	+	+	+	+	+	+	PM Cell	2+
	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Pl Phenotype	



### Case Study 1 Additional Testing

	Rh		MNSs				P	Lewis		Kell	Duffy	Kidd		LSS/AT	LSS/AT	CC						
	D	C	E	e	M	N	S	s	P <sub>1</sub>	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>					
1	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	Vel-	0	2+		
2	0	0	0	+	+	0	0	0	0	0	0	0	0	0	0	0	0	+	Kp <sup>n</sup> -	0	0	2+
3	+	+	0	0	+	+	+	+	0	0	0	0	0	0	0	0	+	+	Lu (a-b-)	0	0	2+
4	+	+	0	0	+	+	+	0	0	0	0	+	+	0	0	0	+	+	Ch-	0	0	2+
5	0	0	0	+	+	0	0	0	+	+	+	+	+	+	+	+	+	+	Y <sup>a</sup> -	0	0	2+
6	-	0	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	Y <sup>b</sup> -	0	0	2+
7	+	+	0	0	+	+	+	0	0	0	0	+	+	0	0	0	+	+	Ge2-	0	0	2+
8	0	0	0	+	+	0	0	0	0	0	0	+	+	0	0	0	+	+	Rg-	0	0	2+
9	+	+	0	0	+	+	+	0	0	0	0	+	+	+	+	+	+	+	Kp <sup>n</sup> -	0	0	2+
10	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	k-	0	0	2+



### Case Study 1 Additional Testing

	Rh		MNSs				P	Lewis		Kell	Duffy	Kidd		LSS/AT	LSS/AT	CC						
	D	C	E	e	M	N	S	s	P <sub>1</sub>	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>					
1	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	Vel-	0	0	2+	
2	0	0	0	+	+	0	0	0	0	0	0	+	+	0	0	0	0	+	Y <sup>a</sup> -	0	0	2+
3	+	+	0	0	+	+	+	+	0	0	0	0	0	+	+	+	+	+	Lu (a-b-)	0	0	2+
4	+	+	0	0	+	+	+	+	0	0	0	0	0	+	+	+	+	+	Ch-	0	0	2+
5	+	+	0	0	+	+	+	0	0	0	0	+	+	+	+	+	+	+	Ch-	0	0	2+
6	0	0	0	+	+	0	0	0	+	+	+	+	+	+	+	+	+	+	Y <sup>a</sup> -	0	0	2+
7	+	+	0	0	+	+	+	0	0	0	0	+	+	+	+	+	+	+	Y <sup>b</sup> -	0	0	2+
8	0	0	0	+	+	0	0	0	0	0	0	+	+	+	+	+	+	+	Ge2-	0	0	2+
9	+	+	0	0	+	+	+	0	0	0	0	+	+	+	+	+	+	+	Rg-	0	0	2+
10	+	+	0	0	+	+	+	0	0	0	0	+	+	+	+	+	+	+	Kp <sup>n</sup> -	0	0	2+
11	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	k-	0	0	2+



### Case Study 1 Additional Patient Information

- The IRL contacted the customer to obtain additional patient diagnosis and medication lists.
- IRL was notified the patient has multiple myeloma and upon further communication with his physician is receiving DARA therapy.

### Case Study 1 Additional Testing

Blood Group System	Rh	MNSs				P <sub>1</sub>	Lewis	Kel 1	Duffy	Kidd	Lutheran	IS	LSS/AT	LSS/AT	LSS/AT	CC							
	D	C	E	e	M	N	S	s	P <sub>1</sub>	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>	Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	L <sup>1</sup>	L <sup>2</sup>	L <sup>3</sup>			
1	R <sub>1</sub> R <sub>2</sub>	+	+	0	0	+	+	0	0	+	0	+	+	+	+	+	+	+	+	0	0	2+	2+
2	R <sub>1</sub> R <sub>2</sub>	+	+	0	0	+	+	0	0	+	0	0	+	+	+	+	+	+	+	0	0	2+	2+
3	IT	0	0	0	+	+	0	0	0	+	0	+	+	+	+	+	+	+	+	0	0	2+	2+



## Case Study 1 Conclusions

- Patient receiving DARA, interference at IAT phase.
- No underlying alloantibodies detected.
- Unable to rule-out the presence of Anti-K with DTT treated cells. Select units that are K- for transfusion therapy.
- Significant delay in transfusion without complete patient history.

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## Case Study 2

- The Immunohematology Reference Laboratory (IRL) received a submission from a customer requesting antibody identification.
- Customer states ABO discrepancy, reactivity in all test phases in Gel and incompatible crossmatch.
- Sample information:
  - 33 year old female
  - 2 previous uneventful pregnancies
  - transfusion history unknown
  - presenting with anemia and thrombocytopenia
  - medication list not available at time of submission

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## Case Study 2 Routine Testing

Interp.	Red Cell Type										Rh		Serum Type			
	Anti-A					Anti-B					Anti-D		A <sub>1</sub> cells		B cells	
<b>Indeterminate</b>	<b>4+</b>					<b>0+</b>					<b>4+</b>		<b>4+</b>		<b>4+</b>	

Blood Group System	Rh		MNSs		P1	Lewis		Kell		Duffy		Kidd		Lutheran		IS	LISS/37C	LISS/IMP/PA	CC					
	D	C	E	c	e	M	N	S	s	P1	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>					Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>	Lu <sup>a</sup>	Lu <sup>b</sup>
1 R <sub>1</sub> R <sub>2</sub>	+	+	0	0	+	+	0	0	+	+	+	+	0	+	+	+	+	+	+	+	3+	3+	3+	
2 R <sub>2</sub> R <sub>2</sub>	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	+	+	+	+	+	3+	3+	3+	
3 rr	0	0	0	+	+	+	0	+	+	+	0	+	0	+	0	+	+	+	+	+	3+	3+	3+	
Auto Control																					0	0	0	2+

Unit Number	IS	LISS/37	LISS/AT (IgG)	CC	Unit ABO				Interpretation
					Anti-A	Anti-B	Anti-D	Interp.	
W2020191234500K	3+	3+	0	2+	4+	0	4+	A+	Incompatible

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## Case Study 2 Additional Testing

	Rh		MNSs		P	Lewis		Kell		Duffy		Kidd		Last Wash LISS/37C	CC	Eluate	CC			
	D	C	E	c	e	M	N	S	s	P1	Le <sup>a</sup>	Le <sup>b</sup>	K					k	Fy <sup>a</sup>	Fy <sup>b</sup>
1	+	0	0	+	+	+	+	0	+	+	+	+	0	+	+	+	+	0	2+	4+
2	0	0	0	+	+	+	0	0	0	0	0	0	0	+	+	+	+	0	2+	4+
3	+	0	0	+	+	+	0	0	+	0	0	0	0	+	+	+	+	0	2+	4+
4	+	+	0	+	+	+	0	0	+	0	0	+	+	+	+	+	+	0	2+	4+
5	0	0	0	+	+	+	0	0	+	+	+	+	0	+	+	+	+	0	2+	4+
6	-	0	+	+	+	+	+	+	+	0	+	0	+	+	+	+	+	0	2+	4+
7	+	+	0	+	+	+	0	0	+	0	0	0	+	+	+	+	+	0	2+	4+
8	0	0	0	+	+	+	0	0	+	0	0	0	+	+	+	+	+	0	2+	4+
9	+	+	0	+	+	+	0	0	+	0	0	+	+	+	+	+	+	0	2+	4+
10	+	0	+	+	0	0	+	+	+	0	0	0	+	+	+	+	+	0	2+	4+

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## Case Study 2 Additional Patient Information

- Irregularity noted with IAT testing. All cells reactive with Polyclonal AHG reagents, however a negative crossmatch result was obtained with Immucor monoclonal anti-IgG reagent.
- Strongly reactive eluate with negative autocontrol.
- The IRL consulted the submitting hospital to obtain additional patient information.
  - Customer notified the IRL the patient was in a clinical trial for Camellia™ anti-CD47
  - and has not been transfused in the last 6 months.

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## Case Study 2 Additional Testing

Interp.	Red Cell Type					Rh		Serum Type								
	Anti-A					Anti-B					Anti-D		A <sub>1</sub> cells**		B cells**	
<b>A Positive</b>	<b>4+</b>					<b>0+</b>					<b>4+</b>		<b>0+</b>		<b>4+</b>	

Blood Group System	Rh		MNSs		P1	Lewis		Kell		Duffy		Kidd		Lutheran		IS**	LISS/37C**	LISS/IG Immucor	CC			
	D	C	E	c	e	M	N	S	s	P1	Le <sup>a</sup>	Le <sup>b</sup>	K	k	Fy <sup>a</sup>					Fy <sup>b</sup>	Jk <sup>a</sup>	Jk <sup>b</sup>
1 R <sub>1</sub> R <sub>1</sub>	+	+	0	0	+	+	0	+	+	+	+	0	+	+	+	+	+	+	0	0	0	2+
2 R <sub>2</sub> R <sub>2</sub>	+	0	+	+	0	0	+	0	+	+	0	+	0	+	+	+	+	+	0	0	0	2+
3 IT	0	0	0	+	+	+	0	+	+	+	0	+	0	+	0	+	+	+	0	0	0	2+
	+	+	0	+	+	+	+	+	+	0	+	0	+	+	+	NT	NT	Autologous cells				

\*\*ABO discrepancy, IS and LISS/37C testing was resolved using a 5X phenotype similar allogeneic adsorption. The IAT was resolved using Immucor Gamma-clone monoclonal IgG reagent.

## Case Study 2 Conclusions

- Interference with all testing due to infusion of anti-CD47.
- Interference was mitigated with the use of Immucor Gamma-clone monoclonal IgG at the IAT phase.
- The use of a 5X allogeneic adsorption resolved the ABO discrepancy and removed the interfering reactivity at IS and 37C testing.
- A phenotype was obtained to aid in further transfusion support.
- Perform crossmatch testing at the IAT phase only using Immucor Gamma-clone monoclonal IgG.

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## Final Thoughts

- Monoclonal antibody therapy shows promising results for the treatment of malignancies, autoimmune disorders and other conditions.
- These new and emerging therapies will continue to provide challenges to Blood Banks.
- Obtaining accurate and timely patient medication history is vital.
- It is recommended that all patients receiving a mAb that is known to interfere with pre-transfusion testing have:
  - A baseline ABO/Rh, antibody screen and antibody identification performed and a complete phenotype or genotype prior to initiating therapy.
- COMMUNICATION is key!

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