Working Party on Rare Donors Case Studies 2025 - #1

A patient with anti-Yt^{a}: to match or not to match?

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Clinical History

An 88-year-old woman presented with anemia.
She was in poor clinical condition and refused further evaluation to determine the cause of anemia.
Her hemoglobin level was 6.6 g/dL requiring transfusion support.

Serologic History

RBC antigen type:

Group A, D– C– E– c+ e+ K– Fy(a-b+) Jk(a–b+) S+s+ Yt(a–b+)

2011: transfusion of 2 RBCs

2016: first detection of anti-Yt^a

2017: Hb 7.7 g/dL; iron deficiency; treated with intravenous iron infusion

Both Direct Antiglobulin Test (DAT) and Antibody identification were performed using Column Agglutination techniques (Bio-Rad ID-System)

Serologic History

2023:

Hb 6.9 g/dL; DAT: negative; additional antibody anti-K

Transfusion of 2 Yt(a+) C– D– E– K– donor units, selected by crossmatching with serum treated with Recombinant Blood Group Antigens (rBGA) ‘Cartwright(a)’ (Imusyn)

February 2024:

Hb 7.2 g/dL; DAT: negative; additional antibody anti-Jk^a

Transfusion of 3 Yt(a+) C– D– E– K– Jk(a–) donor units, selected by crossmatching with serum treated with Recombinant Blood Group Antigens (rBGA) ‘Cartwright(a)’ (Imusyn)

Serologic History

Cause of additional antibodies anti-K and anti-Jk^{a}:

Probably formed upon transfusion in the past:

- 2 RBCs transfused in 2011 were K+
- 2 RBCs transfused in 2023 were Jk(a+)

The Dutch transfusion guideline prescribes selection of Rh phenotype and K matched units for alloimmunized transfusion recipients to prevent further alloimmunization. After first detection of anti-Yt^{a} selected units were K–.

Current Sample Presentation Data

April 2024 (2 months after transfusion), Hb 6.6 g/dL:

DAT: 1+ anti-C3d

Antibody identification: anti-Yt^{a}, anti-K, anti-Jk^{a}

Eluate: anti-Yt^{a}

Challenge with the Current Presentation

Reaction strength of anti-Yt^a has increased, reactions are not blocked by Recombinant Blood Group Antigens (rBGA) 'Cartwright(a)' (Imusyn). Yt(a-) test cells were not reactive.

	Bio-Rad LISS	PEG	Recombinant Blood Group Antigens (rBGA) 'Cartwright(a)' (Imusyn)
2016	weak/1+	weak	negative
2017	1+	weak	negative
2023	1+/2+	1+	negative
February 2024	2+	not tested	negative
April 2024	2+	1+	2+

> Is it still safe to transfuse Yt(a+) products?

None of the known (n=10) Dutch Yt(a–) donors are Jk(a–) and K–.

ISBT Terminology of the System

YT blood group system

ISBT symbol (number): YT (011)

Antigens:

Yt^a (011001): high prevalence

Yt^b (011002): polymorphic

Other high prevalence antigens: YTEG (011003), YTLI (011004), YTOT (011005), YTGT (011006)

Chromosome: 7q22.1

Gene name: *YT (ACHE)*

Carrier molecule: GPI-linked glycoprotein that probably exists as a dimer in the RBC membrane. AChE terminates nerve pulse transmission. The function in RBCs is unknown.

Brief Review of the Blood Group System or Antibody

Clinical significance of anti-Yt^{a}:

Risk for transfusion reactions: no to moderate (rare)/delayed[1].

Anti-Yt^{a} are often benign and antigen-negative blood may not need to be transfused.[1,2,3,4] However, transfusion reactions are described[5] and the significance can change over time[6].

The risk for an acute hemolytic transfusion reaction is low when the antibody reaction strength is weak ≤2+ (0-4) by IAT crossmatch, while for strong examples of the antibody preferably Yt(a-) blood should be selected[3] .

Solution to Blood Needs

Previously Yt(a+) RBCs were transfused without transfusion reactions (period 2016-2024). However, the antibody reaction strength has increased.

Possibilities for transfusion:

- Yt(a–) K– Jk(a–): not available at national level. An international search could be performed.
- Compromising to D+ did not lead to available donors.
- Family studies were not performed: no eligible siblings were available.
- No matching for Yt^a.
- Other supportive therapy, like (iv) iron supplementation.

Possible additional studies to evaluate the risk of anti-Yt^{a}

Testing with an antiglobulin reagent that lacks anti-IgG4 can be useful in case the anti-Yt^{a} is of the IgG4 subclass which is generally not considered to be clinically significant.

The Monocyte Monolayer Assay (MMA) can be valuable in predicting *in vivo* cell destruction of incompatible transfused RBCs. [7,8,9]

Solution to Blood Needs

No international search was performed because:

- For this patient, previous transfusion with Yt(a+) RBCs was uncomplicated.
- Uncertainty exists regarding the relevance of the antibody's stronger reaction.
- The patient was in poor clinical condition, and delay of transfusion was considered undesirable.

Conclusions

88-year-old women in poor clinical condition with anti-Yt^a with increased reaction strength. Compatible donor blood with this rare type was not available:

Group O or A, Yt(a–) Jk(a–) K–.

Follow-up:

Yt(a+) Jk(a–) K– (and C– D– E– Fy(a –) to prevent further alloimmunization) blood was transfused without signs of a transfusion reaction. The hemoglobin level and blood tests indicating possible hemolysis (bilirubin, haptoglobin) were not measured post transfusion. Unfortunately, the patient passed away a few months later

Summary of Case Challenges

The significance of an increased reaction strength of anti-Yt^{a} for an individual patient is uncertain.

With limited clinical information, a choice had to be made for RBC selection.

The formation of additional alloantibodies complicated the blood provision.

Lessons Learned by the Case

Not all antibodies against HPA*'s are clinically significant in all cases. The relevance of anti-Yt^a should be judged per patient and can change over time.

Clinical data is important to monitor the transfusion strategy and to advise for future transfusions.

In case of HPA-incompatible transfusion it is (depending on availability and time) advisable to match for DCEce, K, Jk^a Jk^b, Fy^a Fy^b, Ss antigens to prevent further alloimmunization. The additional antibodies, anti-K and anti-Jk^a, that complicated blood provision in this case, could have been prevented.

*HPA: high-prevalence antigen

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