# Working Party on Rare Donors Case Studies 2023 - #1

**Patient with anti-Jk3**

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# Clinical History

A 42-year-old Polynesian female presented with ongoing Melena possibly associated with a gastrointestinal bleed.

The patient was critically ill, with a very low Haemoglobin (Hb) requiring transfusion support.

Melena or melaena refers to the dark black, tarry faeces (stools) that are associated with upper gastrointestinal bleeding.

# Serologic History

The patient had no known recent history of transfusion but a history of anti-Jk3.

# Current Sample Presentation Data

ABO/Rh: O RhD Positive

DAT: Negative

Antibody Screen Method: Column Agglutination (BioRad ID-System)

Antibody Screen Results: Positive with all cells

Antibody Identification Method: Column Agglutination (BioRad ID-System)

Antibody Identification Preliminary Results: Positive with all cells except the auto control

# Phenotyping and Genotyping Results

Phenotyping by serology using a pre-transfusion sample was performed using liquid antisera and standard tube techniques.

C+E-c-e+,K-, Fy(a+b-), Jk(a-b-), M+N-S-s+

Genotyping was performed using Immucor Array Imaging System (AIS™) and BASIS® Software and the HEA BeadChip™ test kit.

C+E-c-e+, K-k+Kp(a-b+), Fy(a+b-), Jk(a-b+), M+N-S-s+, Lu(a-b+), Co(a+b-), V-, VS-, U+, Js(a-b+), Di(a-b+), Sc1+,Sc2-, Do(a-b+), Hy+, $Jo^a$+, LW(a+b-).

# Phenotyping / Genotyping Discrepancy

The $Jk^b$ phenotype and genotype results did not match because the Immucor BioArray™ HEA Precise BeadChip™ does not detect the molecular variant responsible for the Jk(b-) phenotype that is most common in the Asia Pacific region.

The Jk(a-b-) phenotype was confirmed by sequencing using the Illumina DNA Prep with Enrichment with a custom designed panel targeting 43 blood group systems and transcription factors KLF1 and GATA1.

# Final Results

The presence of anti-Jk3 was confirmed and there were no other alloantibodies detected in the patient's sample.

# Challenge with this Case

This patient required ongoing transfusion support until the source of the bleeding was identified and corrected.

At the time there were only 7 Group O Jk(a-b-) donors registered in Australia and a small stock of frozen inventory.

The patient received 2 thawed units from our frozen inventory.

Three (3) suitable Group O Jk(a-b-) donors were contacted to donate fresh units, but only 1 donor was able to donate at the time.

# Challenges with this Case

Meanwhile, we had two other patient requests for Jk(a-b-) units:

- A 71-year-old female that developed anti-Jka and anti-Jk3 following receipt of a massive transfusion protocol and requiring further transfusion support.
    - Day 1 – negative antibody screen, 4 units of red cells
    - Day 2 – negative antibody screen, 12 units of red cells
    - Day 10 – anti-Jka detected, 1 unit of red cells Jka-
    - Day 15 – anti-Jka and anti-Jk3 detected, 1 unit of red cells Jk(a-b-)

- A 25-year-old female with Primary Mediastinal large B- cell lymphoma being treated with chemotherapy (EPOCH regimen) was phenotyped as Jk(a-b-) but no antibodies detected and requiring transfusion support. The patient was not being considered for transplant at this time.

# Challenges with this Case

| Phenotype | White | Black | Asian |
|---|---|---|---|
| Jk(a+b-) | 26.3% | 51.1% | 23.2% |
| Jk(a-b+) | 23.4% | 8.1% | 26.8% |
| Jk(a+b+) | 50.3% | 40.8% | 49.1% |
| Jk(a-b-) | Rare | Rare | 0.9%* |

*Predominately Polynesian

There was not enough Jk(a-b-) blood available in Australia to support all 3 patients.

Family studies on all 3 patients were requested.

# Family Study information

The family of this patient (42-year-old female) were asked to provide samples as potential blood donors

- Three family members (nieces and nephews) were found to be Jk(a-b-) and were ABO and RhD compatible.

The 71-year-old female patient had 5 family members of Polynesian origin tested but they were all Jk(a+).

The 25-year-old female patient from the Philippines had no family in Australia.

# Solution to Blood Needs

Family studies to recruit relatives with same rare phenotype – 3 new donors identified.

Recruit friends from the same community (ethnic group) – in this case the family worked with us to recruit blood donors from the Polynesian community in Australia – 9 new donors identified.

Social media was used to raise awareness.

Sourced rare units from the New Zealand (NZ) Blood Service.

# Conclusions

Two red cell units were collected from family members of the original patient.

Two red cell units were imported from NZ .

The patient's condition stabilized after receiving 2 thawed units and one fresh unit collected from a family member.

The second unit from a family member was frozen 10 days post collection.

The fresh unit collected from an unrelated Australian donor and the 2 units from NZ were not used for this patient.

# Conclusions

The 71-year-old female patient was transfused with the fresh unit collected from an unrelated Australian donor. The patient was stabilized and received no further transfusions.

The 25-year-old female patient received the units imported from NZ.  Jk(a-b-) units were not used for further transfusion support for this patient.

# ISBT Terminology of the System

Kidd Blood Group System

ISBT symbol (number): JK (ISBT 009)

| Antigens | |
|---|---|
| $Jk^a$ | JK1 (009001) |
| $Jk^b$ | JK2 (009002) |
| Jk3 | JK3 (009003) |

Chromosome: 18q12.3

Gene name: *SLC14A1*

Number of exons: 10

The Kidd blood group system consists of 3 antigens carried on a multipass type 3 membrane glycoprotein that functions as the primary urea transporter on RBCs. It consists of 389 amino acids and has 10 membrane-spanning domains.

# Brief Review of the Blood Group System or Antibody

The Kidd blood group system (ISBT09) was first described in 1951 when a new antibody was identified during the investigation of haemolytic disease of the foetus and newborn – anti-$Jk^a$.

There are three antigens, $Jk^a$ and $Jk^b$, are polymorphic.
The third, Jk3, is of very high prevalence in all populations except in individuals of Polynesian, Pilipino and Finnish extraction.

Antibodies to $Jk^a$, $Jk^b$ and Jk3 are stimulated by transfusion or pregnancy and are rarely reported as naturally occurring.
Detection of these antibodies may be difficult. They are frequently only weakly reactive and may show dosage.

The antibodies are highly significant in transfusion, they generally cause only mild haemolytic disease of the foetus and newborn (HDFN).

# Summary of Case Challenges

Limited number of suitable donors available locally

Multiple patients requiring the same rare phenotype at the same time

Increasing demand for this rare blood group

A survey conducted by the ISBT Working Party on Rare Donors presented at the ISBT 2020 Virtual Congress identified:

- 285 Jk(a-b-) donors are available internationally
- 130 are group O and only 8 are O negative
- one of the 61 unmet requests was for Jk(a-b-) units

# Lessons Learned from this Case

The 3 patients were assessed to help prioritise their clinical need and urgency.

Transfusion plans were prepared for all 3 patients based on the assumption that no Jk(a-b-) units would be available for transfusion at the required time.

The patients were closely monitored to ensure that the Jk(a-b-) units were reallocated to one of the other patients if not required for transfusion.

# Example of a transfusion plan

**TRANSFUSION MANAGEMENT PLAN FOR RARE RED CELL REQUIREMENTS IN PREGNANCY**

Name:

Date of Birth: Hospital MRN:

**This patient has a rare blood group requirement due to presence of a rare red cell antibody. Very few if any available units may be available around delivery.**

***Please contact the haematologist on call and Blood Bank PRIOR to considering transfusion of any red cells.***

**Key contacts**

Obstetrician: _____ Haematologist: _____

Lifeblood Transfusion Medicine Specialist or Registrar_____

**Transfusion Laboratory Results**

Blood group: DAT:

Extended red cell phenotype:

Antibody screen results:

Antibody titre:

Genotype:

Risk of HDFN with antibody: ☐ Low ☐ Moderate ☐ Severe

Risk of haemolytic transfusion reaction with antibody: ☐ Low ☐ Moderate ☐ Severe

**Other relevant results** (include most recent results and date)

Haemoglobin: Iron studies (If ferritin <100ug/L, replace iron):

Partner's phenotype/genotype (if available):

Eligible family members tested as potential donors: ☐ Yes ☐ No ☐ No family members available

**Clinical Information**

Other relevant medical conditions eg. Thalassemia:

Current antiplatelets/anticoagulants:

Risk factors for haemorrhage:

☐ Previous pregnancy related complications – previous LSCS, PPH

☐ Placentation issues – placenta previa, placenta accreta

☐ Increased uterine tone – multiple pregnancies, macrosomia

☐ Medical comorbidities – personal or family history of bleeding diathesis, diabetes, age > 35 years

MCA doppler results:

**Delivery plan**

Expected delivery date and hospital:

Planned delivery modality:

Antiplatelet/anticoagulation to be withheld from this date (if relevant):

Available red cell units and quantity:

☐ Fresh local _____ ☐ Fresh international _____ ☐ Cryopreserved _____ ☐ No available units

Blood group of available red cell units:

Location of available units: ☐ On site at local hospital ☐ At Lifeblood

**Transfusion plan:** Contact obstetrician, haematologist and anaesthetist when in labour

Consider: Active management of third stage of labour, use of oxytocics, cell saver (if available)

In case of major obstetric haemorrhage, activate massive transfusion protocol (MTP):

- Give platelets, cryoprecipitate, fresh frozen plasma as per local MTP. Transfuse fresh phenotype matched red cell units if available
- Tranexamic acid 1g intravenously to be administered
- Consider recombinant activated Factor VII (Novoseven), in discussion with haematology team
- If refractory bleeding, consider
  - Balloon tamponade
  - Interventional radiology (if available) for uterine arterial embolisation
  - Surgical measures (hysterectomy)
- Consider ABO, Rh and Kell matched units with close monitoring for haemolytic transfusion reaction

**Post-partum**

*Maternal management*

- Monitor blood loss and fundal height
- Minimise unnecessary phlebotomy, consider paediatric tube collection
- Consider intravenous iron
- If symptomatic anaemia, consider transfusion if appropriate red cell units available.

*Newborn monitoring*

- Check cord blood full blood count, bilirubin, DAT, blood group and antibody screen
- Monitor for jaundice

**Approved by:**

Haematologist:_____ Obstetrician: _____ Date:_____

Acknowledgement: Dr Harshita Rajasekariah

# Lessons Learned from this Case

Understanding the diversity of your population and how this compares to the diversity of your donor population is essential to plan for future needs and increases in demand.

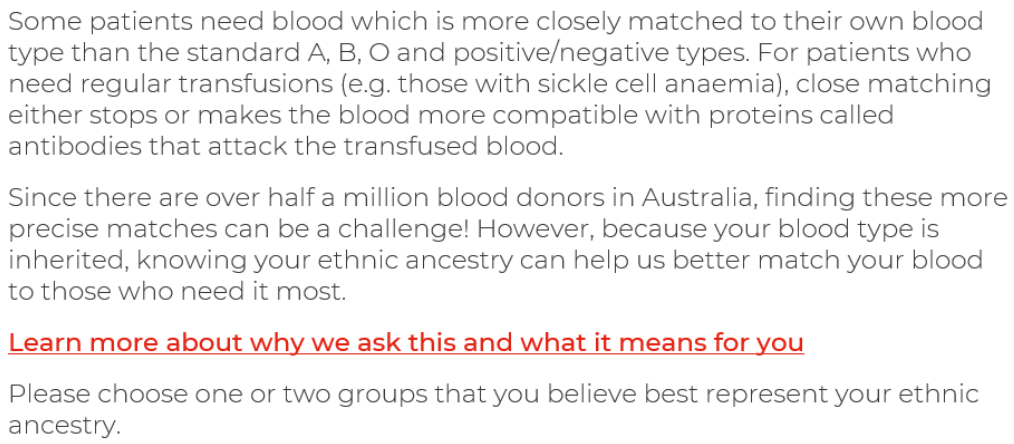
Many studies have found that the facilitators and barriers to blood donation experienced by those in ethnic minority groups within a society are complex and exist concurrently.

We needed to understand whether there are specific needs among Polynesian Australians (e.g., for information and process) to help them consider donating blood.

# Further Information

Lifeblood established a donor ethnicity question to assist with identifying donors to target for phenotyping and/or genotyping.

A comprehensive list of ethnicities, with detailed information about why this information is needed, can create a greater understanding and willingness to provide the information.



Some patients need blood which is more closely matched to their own blood type than the standard A, B, O and positive/negative types. For patients who need regular transfusions (e.g. those with sickle cell anaemia), close matching either stops or makes the blood more compatible with proteins called antibodies that attack the transfused blood.

Since there are over half a million blood donors in Australia, finding these more precise matches can be a challenge! However, because your blood type is inherited, knowing your ethnic ancestry can help us better match your blood to those who need it most.

Learn more about why we ask this and what it means for you

Please choose one or two groups that you believe best represent your ethnic ancestry.

Ethnic Ancestry - Australian Red Cross Lifeblood

https://www.lifeblood.com.au/contact/self-service-system-support/ethnic-ancestry

# Further Information

Lifeblood worked with the Polynesian community in Australia to improve Lifeblood's recruitment and retention of regular donors with Polynesian ancestry to increase our ability to identify Jk(a-b-) blood donors.

A donor recruitment video (link below), a photoshoot of 'Pacific Donors', and email templates were designed with donors that were members of the Pacific Donor Lifeblood team.

Pacific Donor Drive - Australian Red Cross Lifeblood - YouTube

https://www.youtube.com/watch?v=nZvya_Akc6A

# References


1. https://www.isbtweb.org/isbt-working-parties/rcibgt/blood-group-allele-tables.html
2. Marion E. Reid, Christine Lomas-Francis, Martin L. Olsson, JK - Kidd Blood Group System, The Blood Group Antigen Facts Book (Third Edition), Academic Press, 2012.
3. Hamilton, J.R. (2019), Kidd blood group system: outwardly simple with hidden complexity. VOXS, 14: 3-8. https://doi.org/10.1111/voxs.12458
4. Gahan L, Gemelli CN, Kruse SP, Davison TE. Designing and testing an ethnic-ancestry question for Australian blood donors: Acceptability, feasibility, and understanding. Transfusion Medicine. 2022;1-6. doi:10.1111/tme.12865
5. Gahan L, Jensen K, Masser B, Thomas W. Polynesian-Australian Co-Design Study Business Report, November 2021.
6. Nance S, Lomas-Francis C, ISBT Working Party on Rare Donors Members. Where in the world are rare donors: A working party on rare donors survey. ISBT Barcelona Abstract #P-043, ISBT 2020 Virtual Congress.

# Acknowledgment

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