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| STIR Bulletin Number 6 |
| November 2020  Issue of O RhD negative emergency red cell units – not without risk |

A 58-year- old man was admitted to the emergency department following an assault that resulted in head and facial injuries with associated blood loss. During admission he had significant haemoptysis, became hypotensive and the health service critical bleeding protocol was activated. He received two units of O RhD negative emergency issue red cells.

The laboratory performed pretransfusion testing on a specimen taken prior to the start of the transfusion, which revealed the patient had an anti-Jka (Kidd) antibody. The emergency issue RBC units had already been fully transfused by the time the antibody screen was completed. Subsequently, these units were phenotyped and shown to be Jka positive.

Post transfusion the patient developed a fever and was noted to have red/dark urine. Hb dropped from 151g/L to 81g/L, with biochemical features of haemolysis and evidence of disseminated intravascular coagulopathy: ↑ bilirubin 124umol/L, ↑ LDH 419U/L, ↑ INR 2.1, ↑ APTT 40.7 sec, ↓ fibrinogen 0.9 g/L, ↑↑ D-dimer 22410 ng/mL. His platelet count dropped from 75 x 109/L to 25 x 109/L. The patient received 10 units of cryoprecipitate and two units of FFP prior to transfer to a tertiary health service.

This case highlights an example of an acute haemolytic transfusion reaction to pre-existing Jka antibodies after emergency transfusion of O RhD negative red cells. This is not an isolated event. Whilst transfusion should not be delayed when a patient is clinically compromised by significant bleeding, medical staff need to be aware that emergency issue O RhD negative units are not risk free. If there are pre-existing red cell alloantibodies transfusion may be associated with a haemolytic transfusion reaction. Emergency issue O RhD negative red cells units remain the safest option in a life-threatening situation when crossmatched blood is not available for transfusion, but should not be considered outside of an emergency. O RhD negative units carry the inherent risks of all transfusion - the clinical risk and benefit must be equally considered before any blood product exposure.

The supply of O RhD negative red cells is limited and care must be taken to use these units judiciously and only as clinically required. Demand for O RhD negative red cells is well in excess of the percentage of donors who are O RhD negative.

Both ANZSBT guidelines and NPAAC standards permit use of group O RhD positive red cells for emergency transfusion to males and females ≥50 (defined age varies between health services). Health services should consider developing local policies to direct selection of group O red cells for emergency transfusion, including the use of group O RhD positive red cells where appropriate.

Clinical staff must provide the laboratory with a pretransfusion sample as soon as possible in critical bleeding events where group O emergency issue units are employed: this should be obtained prior to administration of the first emergency issue red cell unit. This ensures the blood sample being tested contains only the patient’s blood and not transfused donor red cells. A sample taken after an emergency issue red cell transfusion has commenced makes serological testing more complex and ambiguous, due to mixed field reactions. This in turn may result in an ongoing requirement for precious O RhD negative blood if a blood group cannot be determined.

As soon as is clinically feasible, the patient with ongoing blood requirements should be changed to group specific units (saves group O RhD negative) and then crossmatched units (reduces the risk of a serological transfusion reaction).

Clinical staff administering blood products should receive education and follow routine protocol when administrating these units. All checks are still required in an emergency. For example, in an incident reported to STIR, O RhD negative emergency issue units were administered despite being past their expiry date. The expiry date had not been checked by either the laboratory or the clinical staff.

Emergency transfusion creates a high pressure environment for both laboratory and clinical staff. Laboratory computer systems may be by-passed during the emergency issue of blood components with a reliance on human factors for safety. Care must be taken to always perform pretransfusion checks to avoid transfusion of an inappropriate or incorrect blood component.

In addition to routine checks and procedures the ongoing need for transfusion should be under continual clinical assessment.

Staff should be aware that although O RhD negative is the emergency issue group for red cells (sometimes referred to as “universal” donor), this is not the case for plasma products. AB is the emergency issue group for plasma (contains no anti-A or anti-B antibodies). Errors related to staff understanding of ABO and RhD compatibility are regularly reported to STIR. Questions or concerns regarding compatibility of blood components should be addressed directly to the transfusion laboratory.

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| Group | ABO antigens on red blood cell | Antibodies in plasma |
| O | **Nil** (emergency issue RBC) | anti-A and anti-B |
| A | A | anti-B |
| B | B | anti-A |
| AB | A and B | **Nil** (emergency issue plasma) |

Communication is pivotal in emergency transfusion during critical bleeding events. Having a key clinical contact liaising with the transfusion laboratory is optimal. Regular communication with the transfusion laboratory about ongoing requirements and the availability of compatible products assists with the provision of the most appropriate blood components for patient safety and appropriate inventory management.

Knowledge of a patient’s antibody history along with informing patients of the significance of their red cell antibodies is an important consideration for future transfusion. Ensure transfusion history and any known or new red cell antibodies are recorded in the patient’s medical record (electronic or paper-based). It is essential the patient, the patient’s family and the treating clinicians are aware of the importance of passing on this information to the transfusion service. Even if there is not time for compatibility testing in an emergency situation the transfusion scientist may be able to select the most appropriate group O emergency issue red cells (antigen negative to the known antibody) and help avoid a transfusion reaction occurring. The laboratory will determine the relevance of information given to them – they are only aware of information if it is passed on to them and all too often are not provided with vital clinical information.

Most laboratory information systems are not linked to each other so each transfusion service can only access information from within their own network.

An antibody registry would facilitate more rapid provision of compatible red cells to patients with previously known red cell antibodies and the identification of antibody specificity.

Glossary:

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| **Term** | **Definition** |
| Uncrossmatched emergency issue group O red cells: | Red cells units issued for use where transfusion is urgently required, particularly in a life-threatening situation where the pretransfusion specimen has not yet been received or tested and compatibility testing has not been completed.  When uncrossmatched red cells are issued, a crossmatch segment from the unit should be retained in the laboratory for retrospective testing. |
| Group specific red cells: | ABO/RhD compatible red cells issued to a patient once pretransfusion sample testing has confirmed ABO/RhD type of the patient. Ideally this should be the same group as the patient, but must be ABO/RhD compatible with the patient. Confirmation with a known historical ABO/RhD type or repeat testing needs to confirm the ABO/RHD type of the patient. The pretransfusion antibody screen result may not yet be available. Group specific red cells must NOT be issued based upon historical ABO/RhD type of the patient alone without confirmation of type from a current sample. |
| Compatibility testing  or  Crossmatch: | A test confirming compatibility between the patient’s plasma and the donor red cells. This may be performed by either serological or electronic methods. |
| Acute haemolytic transfusion reaction (AHTR)\* | Clinical or laboratory features of haemolysis presenting within 24 hours of transfusion.  Common signs of AHTR are fever, chills/rigors, facial flushing, chest pain, abdominal pain, back/flank pain, nausea/vomiting, diarrhoea, hypertension, pallor, jaundice, oligo/anuria, diffuse bleeding and dark urine. Common laboratory features are haemoglobinaemia, haemoglobinuria, decreased serum haptoglobin, unconjugated hyperbilirubinemia, increased LDH and AST levels and decreased haemoglobin levels.  STIR definition for reporting:  Acute HTR is suspected if the patient has fever and other signs/ symptoms of haemolysis (including dyspnoea, hypotension, tachycardia, back pain, dark urine) **within 24 hours** of transfusion confirmed by one or more of the following:   * failure to achieve expected rise of the Hb post-transfusion or a drop in Hb > 20g/L within 24 hours (excluding all causes for ongoing bleeding) * rise in lactate dehydrogenase (LDH) > 50 per cent within 24 hours * rise in bilirubin, free haemoglobin (plasma or urine) * positive direct antiglobulin test (DAT) * incompatible crossmatch   (SHOT, 2019) |
| Delayed haemolytic transfusion reaction (DHTR)\* | Clinical or laboratory features of haemolysis that present more than 24 hours to 28 days after a transfusion. Signs and symptoms are similar to AHTR but are usually less severe. DHTR may sometimes manifests as an inadequate rise of post-transfusion haemoglobin level or unexplained fall in haemoglobin after a transfusion. Post transfusion serology usually shows abnormal results.  STIR definition for reporting:  Delayed haemolytic transfusion reaction occurs, **more than 24 hours to 3 months** after a transfusion.   * there is demonstration of clinically significant antibodies against red blood cells (as described in the ANZSBT guidelines for Transfusion and Immunohaematology Laboratory Practice, 1st Edition, Revised January 2020) which were previously absent and * where there are clinical and laboratory features of haemolysis. * If markers of increased red cell destruction are unavailable or not supportive of a haemolytic process, the event is classified as a delayed serologic transfusion reaction.   The reaction may be confirmed by **one or more** of the following:   * a fall in Hb or failure to increment * rise in bilirubin and LDH * incompatible cross match not detectable pre-transfusion.   (SHOT, 2019 and Australian Red Cross Lifeblood, 2018) |
| Delayed serologic transfusion reaction (DSTR)\* | When after a transfusion, there is demonstration of clinically significant antibodies against red blood cells which were previously absent (as far as is known) and when there are no clinical or laboratory features of haemolysis. This term is synonymous with alloimmunisation.  STIR definition for reporting:  Delayed serologic transfusion reaction occurs, within **24 hours to 3 months**, after a transfusion.   * there is demonstration of clinically significant antibodies against red blood cells (as described in the ANZSBT guidelines for Transfusion and Immunohaematology Page 16 STIR reporting guide 2020 Laboratory Practice, 1st Edition, Revised January 2020) which were previously absent and * where there are no clinical or laboratory features of haemolysis. This term is synonymous with alloimmunisation.   (NBA: Australian Haemovigilance Minimum Data Set, 2015) |

\*NBA, 2015 Australian haemovigilance minimum data set

References:

ANZSBT [Guidelines for Transfusion and Immunohaematology Laboratory Practice](https://anzsbt.org.au/wp-content/uploads/2020/03/Guideline_-for_Transfusion_and_Immunohaematology_Laboratory_Practice_20200326_FINAL_Published_SecurePW-1.pdf), revised 1st edition - January 2020 <https://anzsbt.org.au/wp-content/uploads/2020/03/Guideline_-for_Transfusion_and_Immunohaematology_Laboratory_Practice_20200326_FINAL_Published_SecurePW-1.pdf>

Blood Matters Serious Transfusion Incident Reporting Guide 2020 <https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/speciality-diagnostics-therapeutics/blood-matters/serious-transfusion-incidents>

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