

Platelet Tips for Inventory Management in Shortages (Platelet TIMS)

Introduction

During platelet shortage situations, screening and management of platelet orders are required, including the discussion of platelet requests with ordering physicians. The use of ABO and/or Rh mismatched platelets, the downward revision of platelet transfusion thresholds, and dosing adjustments may all be necessary.

Major and Minor Mismatches in Platelet Transfusion

ABO antigens are present on the surface of platelets, and the plasma in which the platelets are suspended may contain anti-A and anti-B isoagglutinins. A major mismatch or 'cellular-incompatible' platelet transfusion occurs when the transfused platelets, or the red cells in the platelet component, exhibit antigens not present in the recipient e.g. group A platelets to a group O recipient or D positive platelets to a D negative recipient. A minor mismatch, or 'plasma-incompatible' transfusion occurs when the plasma in the platelet component contains antibody to antigens on the recipient's red cells e.g. group O platelets to a group A recipient. Several reviews of this topic are available^{1,2,3,4}.

ABO non-identical platelets

While ABO-identical platelets are the preferred component, these may not always be available in a shortage situation. Transfusion of cellular-incompatible platelets may lead to a decreased post-transfusion platelet count increment (PCI), although it is unclear whether this has significant clinical consequences. This effect is cumulative after multiple cellular-incompatible transfusions^{5,6,7}.

Transfusion of plasma-incompatible platelets, especially group O platelets to a non-group O recipient, carries the risk of hemolysis in the recipient, although this is uncommon. The true incidence is difficult to quantitate due to under-recognition, but is in the order of magnitude of from 1:100 to 1:9,000. Depending on the method used and the definition of high titre, approximately 10-40% of group O platelets contain high titres of isoagglutinins^{8,9}. Plasma-incompatible platelet transfusion may also lead to a positive direct antiglobulin test (DAT) in the recipient. Canadian Blood Services (CBS) does not measure titres of anti-A or anti-B in whole blood or apheresis platelet donors, although this is done in other countries (Australia, UK).

The selection of platelets for transfusion is shown in the Table¹⁰.

Patient ABO Group	Platelet Donor ABO Group		
	1 st Choice	2 nd Choice	3 rd Choice
O	O	A, B, AB	N/A
A	A	AB	B, O
B	B	AB	A, O
AB	AB	A, B	O

Options for approaching an ABO plasma-incompatible transfusion:

- Perform anti-A and/or anti-B titres on the platelet component. Titres do not predict the severity of hemolysis, which can occur at a titre as low as 32^{11,12}. Titres may be performed with tube, gel, or microplate technology, using saline or anti-human globulin (AHG) methods, and with manual or automated techniques, so there is no generally accepted titration method or definition of high titre. Titres may be done by serial dilution or by using a single pre-defined titre. Commonly used definitions of high titre using a saline tube method include 50, 64, 100, and 200. Titres in saline detect primarily IgM isoagglutinins and titres by AHG methods detect primarily IgG isoagglutinins.



Titres in saline and gel do not correlate exactly⁹. Eighteen percent of respondents to an IQMH survey in 2003 stated that they titre platelets for plasma-incompatible transfusions, with the most popular method being a tube method with a critical titre of 50¹³. A tube method for detecting a titre of 50 or greater is shown below.

High titre group O platelets should only be used for plasma-compatible recipients, or volume reduced if they must be used for plasma-incompatible recipients. For example, if there is a high titre of anti-A, the product must be volume reduced (or not used) for a group A or AB recipient but may be used without volume reduction for a group O or group B recipient.

- Limit the volume of incompatible plasma transfused per 24 hour period e.g. 15 mL for neonate, incrementally higher volumes for older children, and 350 - 600 mL for adults¹⁴.
- Volume reduce the component¹⁴. This results in a 20% reduction in the post transfusion PCI^{15,16}. A method for volume reduction is available in the AABB Technical Manual, 18th edition, Method 6-13, and in the OTTRM manual, method CSP.005¹⁰. Volume reduction may be particularly helpful when transfusing children, small adults, or multiply-transfused patients. This is not a processing activity that requires Health Canada regulation.
- Do none of the above (but see “Standards” section below). An international survey by the BEST collaborative in 2008 revealed that 30-40% of respondents did not test or intervene for high titre group O platelets at that time¹⁷. A College of American Pathologists (CAP) survey in 2005 revealed that 17% of laboratories did not have a policy for managing plasma-incompatible platelet transfusions².

Canadian and US Standards for Mismatched Platelet Transfusions

- CSTM Standard v4 (2017) clause 5.4.3.4: “Recipients should be transfused with platelet concentrates in which the plasma is ABO compatible with the recipient’s red cells. There shall be an established policy for ABO/Rh group substitution.”
- CSA Standard Z902-15 clause 10.7.7: “The donor plasma in platelets should be ABO compatible with the recipient’s red cells. A policy shall be in place concerning group substitution when compatible platelets are not available.”
- Both the AABB and CAP accreditation standards require the laboratory to have a policy for the use of ABO non-identical platelets¹⁸.

Rh non-identical platelets

Although platelets do not express Rh antigens, the component contains red cells (about 0.5 mL in a buffy coat pool and less than 0.001 mL in an apheresis donation), which may trigger an immune response in the recipient¹⁹. If Rh positive platelets must be given to an Rh negative female of child-bearing potential, Rh immune globulin (RHIG) should be given to prevent sensitization. One 300 µg dose of RHIG will protect against exposure to 15 mL of red cells. Based on the RHIG half-life of 3 weeks, one dose should cover multiple Rh positive platelet transfusions for 4 weeks. RHIG prophylaxis is not necessary for males, or for females without childbearing potential, because the alloimmunisation rate is very low at 1.44%²⁰. Administration of RHIG, which is passive anti-D, complicates future compatibility testing and precludes the use of an electronic crossmatch until the passive antibody has disappeared from the circulation. In these situations, transfusion may be delayed.

Platelet Transfusion Thresholds

These are detailed in Appendix F of the Ontario Plan. Note that the thresholds for lumbar puncture and head trauma/CNS surgery are lower in Amber than in Green Phase. There are no robust randomised controlled trials to guide platelet thresholds before invasive procedures, and these recommendations are based on observational and retrospective studies, and on expert opinion²¹⁻²⁴. Consideration should be given to lowering the threshold for prophylactic platelet transfusion in patients with bone marrow suppression/failure from $10 \times 10^9/L$ to $5 \times 10^9/L$ in Amber phase²⁵ or switching to a therapeutic transfusion strategy (only for days with bleeding)²⁶.



Splitting platelet doses

If a sterile docking device is available, one platelet dose can be split into multiple doses²⁷. Health Canada advises that splitting doses of platelets is considered aliquotting and is not a processing activity which requires registration.

Extending component shelf life

This should not be done without authorization by the National Advisory Committee on Blood and Blood Products (NAC) and/or the National Emergency Blood Management Committee (NEBMC). CBS now provides platelets with a seven day shelf life.

Method for performing anti-A and anti-B titres on group O platelets (used at multiple Ontario hospitals)

1. Prepare a 1:50 dilution of platelets in normal saline.
2. Place a drop of 3-5% A1 cells and B cells into appropriately labeled test tubes.
3. Using a plastic pipette, place 2 drops of the prepared 1:50 dilution of the platelet:saline mix into each test tube.
4. Centrifuge the tubes at 3500 rpm for 15 seconds.
5. Read tubes macroscopically for agglutination or hemolysis.

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Allison Collins MD FRCPC
Clinical Project Coordinator, Ontario Regional Blood Coordinating Network (ORBCoN)

