



Life Blood Issue 12

Dear Lifeblood Reader

Welcome to the 12th edition of Life Blood. WPBTS remains dedicated to providing safe blood to recipients whilst caring for our donors. In this edition we've included an overview of platelets and highlighted the value of apheresis megaplatelet platelet transfusions. Some useful guidelines to paediatric transfusions and indications for gamma- irradiated products are also included. In our continued efforts to eradicate misdirected transfusions due to clerical errors, we urge clinicians and ward staff to document all adverse reactions to enable us to follow up with the necessary investigations. Infection control is emphasized in the light of the recent H1N1 pandemic and the current Rift Valley Fever outbreak. For more information go to www.doh.gov.za

WPBTS is committed to continued transfusion medical education and congratulate Michelle Breuninger on her appointment as the new Training Manager. We are currently doing a brand audit and appreciate all the feedback from participating clinicians. As we welcome suggestions for improvement, our marketing officer, H Alie is available for comments on telephone 021 5076326, cell phone 083 4543455 or e-mail marketing@wpbts.org.za.

Dr Makan
WPBTS, Medical Officer

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WPBTS Clinical Advice

Should you have a transfusion-related query or require a clinician presentation at your hospital please contact Dr Arthur Bird, WPBTS Medical Director/CEO or Dr Juanita Makan, WPBTS Medical Officer on the details listed below.

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Your Questions Answered

Q: Does cryosupernatant contain vitamin K dependent coagulation factors?

A: Cryosupernatant is a unit of plasma where half the amount of fibrinogen, fibronectin and FVIII has been removed. Thus cryosupernatant contains Vitamin K dependent coagulation factors similar to fresh frozen plasma (FFP) and plasma since vitamin K impacts on FII; FVII; FIX; FX; Prothrombin; protein C and protein S.

Cryosupernatant is processed by the WPBTS and stored in limited quantities and is the component of choice in many haematology units for the treatment (with or without plasma exchange) of thrombotic thrombocytopenic purpura (TTP).

A Comparison of Apheresis Megaplatelets and Pooled Random Donor Platelets

	Apheresis Megaplatelet	Pooled Random Donor Platelet
Platelet Yield	>2.4 x 10 ¹¹	>2.4 x 10 ¹¹
Volume	250ml ±50ml	200ml±50ml
Storage Conditions	Stored with continuous agitation for up to 5 days at 22° C.	Stored with continuous agitation for up to 5 days at 22° C.
Donor Exposure	Derived from 1 donor.	Derived from the pooled buffy coat of 5 whole blood donations within 8 hours of collection.
Leucocyte Reduction Process	Leucocyte reduction occurs during the apheresis procedure.	Leucocyte reduced pooled platelets are processed by the Blood Bank on request.
Indications	The indications are the same as for pooled random donor platelets. Recommended for patients who experience febrile reactions as a result of sensitisation to leucocyte antigens and for patients on long-term therapy eg. leukaemia.	For patients with acute cases of thrombocytopenia, defective platelet function, bone marrow failure, acute disseminated intravascular coagulation, congenital disorders of platelet function and who are unlikely to require long-term platelet transfusion therapy.

Benefits of Apheresis Megaplatelets: Since the apheresis megaplatelet is derived from one donor it has the benefit of reduced donor exposure and therefore reduced risk of alloimmunisation to HLA antigens. The integral leuco-reduction process has the benefit of minimal product intervention.



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Leukaemia and Platelet Transfusion

Article: The Threshold for Prophylactic Platelet Transfusions in Adults with Acute Myeloid Leukaemia
Journal: The New England Journal of Medicine
Issue: Volume 337:1870-1875, December 25, 1997, Number 26
[Click here](#) to read.

Paediatric Transfusion Guidelines



(Extract from Clinical Guidelines for the use of Blood Products in SA, 2008, 4th Edition)

The field of transfusion medicine for children shares most of the same principles as that of adults but it has distinctive features which need separate consideration. Those children who require blood products are also among the most intensively transfused of all patients. Because they are likely to have a long lifespan following transfusion, minimising adverse events is of great importance.

For the purpose of these guidelines, neonates are considered to be infants within 4 weeks of the normal gestational age (40 weeks) and infants are children within the first year of life.

Intra-uterine Transfusion (IUT)

This should only be done by specialised units. It is most commonly indicated for correction of foetal anaemia caused by red cell allo-immunisation. Intra-uterine platelet transfusions are rarely indicated and are essentially used only to correct foetal thrombocytopenia caused by platelet allo-immunisation. However, the use of intravenous immunoglobulin in mothers with allo-immunisation has largely replaced foetal platelet transfusions.

Red cell products for intra-uterine transfusions are specially prepared by the blood transfusion service on request by the clinician. They are usually group O, Rh-D negative (preferably also Kell negative), crossmatch compatible with maternal serum, < 5 days old, leucocyte depleted and irradiated.

Neonatal Transfusion

a. Exchange Transfusion

Exchange transfusion may be used to manage severe anaemia at birth and to treat severe hyperbilirubinaemia, usually caused by haemolytic disease of the newborn (HDN). The aim in exchange transfusion is to remove Rh-D positive red cells, reduce bilirubin levels and remove maternally derived anti-D.

The bilirubin level at which an exchange transfusion is indicated varies according to the weight and gestational age of the baby and the South African Neonatal Academic Hospitals' Consensus Guidelines should be followed. (S Afr Med J 2006;96: 819-824). The early administration of intravenous immunoglobulin (1 g/kg) to Coombs positive infants with neonatal jaundice significantly reduces the level of exchange transfusions for hyperbilirubinaemia.



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The red cell component used for exchange transfusion varies nationally and internationally. Some centres use unmodified whole blood while others plasma reduce whole blood to a haematocrit of 0.5-0.6 l/l. Some centres, particularly in the USA, reconstitute red cell concentrates with fresh frozen plasma but it increases donor exposure and is not recommended. The unit should be group 0 (or ABO compatible with maternal and neonatal plasma), Rh-D negative, crossmatch compatible with maternal plasma, < 5 days old, irradiated (must be transfused within 24 hours of irradiation) and leucocyte-depleted. It should not be transfused directly from cold storage and should be warmed during the procedure with care taken to avoid overheating. In normal term infants the routine use of calcium gluconate is unnecessary. However, in sick, preterm neonates monitoring of ionized calcium is advisable.

b. Small volume red cell transfusions

Most neonatal transfusions are small volume (10-20 ml/kg). It should be noted that during the first 4 months of life, blood bank pre-transfusion testing differs from adults. If there are no clinically significant red cell antibodies in the infant or maternal plasma, and the direct antiglobulin test is negative, a full crossmatch is not necessary, although the ABO and Rh-D group should be re-confirmed prior to each transfusion.

Suggested transfusion thresholds for infants < 4 months of age are listed below:

- | | |
|---|------------------------------|
| • Anaemia in the first 24 hours | Hb < 12g/dl (Hct c 0.36 l/l) |
| • Neonate receiving mechanical ventilation | Hb < 12g/dl |
| • Acute blood loss | = 10% blood volume lost |
| • Oxygen dependent (not ventilated) | < 8-11g/dl |
| • Late anaemia, stable patient (off oxygen) | Hb < 7g/dl |

The age of the unit does not matter for small volume top-up transfusions, but large volume transfusions (exchange transfusion or acute blood loss) should be < 5 days old in order to avoid hyperkalaemia and reduced 2,3 DPG levels with poorer oxygen release. Leucocyte depleted products are also recommended for infants < 1 year.

Neonatal units should arrange with their local blood banks that those neonates with extended transfusion needs are placed on a "limited donor exposure" programme where the transfusion requirements of one infant are met by reserving units bled from one donor for a specific infant. This ensures minimum infectious risk and red cell antigen exposure.

c. Specific paediatric products for neonates and infants

The use of an adult red cell concentrate unit, fresh frozen plasma (FFP) or platelet concentrate for infants and small children will result in significant wastage since the volumes required are generally small. The services therefore prepare special products for paediatric use in the following volumes.

- **Red Cell Concentrates**
 - Infant: 120-140ml
 - Neonate: 50-80ml
- **FFP:** 130ml
- **Platelets:** 50-60ml volume; usually aliquoted into 5-6 units obtained from a single apheresis unit



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Platelet transfusion

Thrombocytopenia is common in sick pre-term infants and is associated with an increased risk of severe periventricular haemorrhage. The guideline thresholds for platelet transfusion are:

- **Consider in all neonates:** $< 30 \times 10^9 /l$
- **Consider if increased bleeding risk:** $< 50 \times 10^9 /l$
 - $< 1000g$ and < 1 week old
 - Clinically unstable (e.g. labile blood pressure)
 - Previous major bleeding
 - Current minor bleeding
 - Coagulopathy
 - Planned surgery or exchange transfusion
- **Major bleeding:** $< 100 \times 10^9 /l$

ABO group specific platelets are recommended.

In neonatal allo-immune thrombocytopenia, HPA-compatible platelets are required. In an emergency, use of maternal platelets is an option when the count is $< 30 \times 10^9 /l$.

Dosage: Platelets for neonates are usually prepared from single donor apheresis/ procedures: a dose of 5-10 ml/kg is recommended.

Fresh Frozen Plasma (FFP)

ABO group specific plasma (or AB plasma) is recommended. Group 0 FFP should not be given to neonates who are not group 0 owing to the potential risk of the infusion of significant amounts of anti-A and -B.

FFP should never be used for volume replacement. It should be reserved for neonates with a significant coagulopathy {INR or activated partial thromboplastin time (APTT) ratio > 1.5 and significant risk of bleeding} or who are about to undergo an invasive procedure, at a dose of ± 15 ml/kg.

Transfusion in necrotising enterocolitis (NEC)

Infants with NEC may be infected with neuraminidase-producing organisms such as Clostridium sp. Neuraminidase can strip sialic acid residues from red cell sialoglycoproteins exposing the T-cryptantigen (so called "T-activation"). T-activation can easily be detected by screening the affected red cells with a lectin (arachis hypogea). Adult plasma invariably contains anti-T, a potentially haemolytic IgM antibody. Although there have been well described cases of haemolysis following transfusion in patients with NEC, it is controversial whether T-activation in NEC is predictive for clinically significant haemolysis. As a result, different centres have different policies. It is probably reasonable to provide platelets, FFP and cryoprecipitate with low titre anti-T. Washed red cells are not recommended as a routine as they contain minute volumes of plasma. If unexplained haemolysis occurs the use of washed red cells may then be considered.

Irradiation

Indications for irradiation are outlined below. Note that while irradiation is recommended prior to exchange transfusion, it should not be unduly delayed as a direct result of the irradiation process.

When indicated gamma-irradiation should be administered to all blood products containing significant numbers of white cells (whole blood, red cell concentrates and platelets).



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Indications for gamma-irradiated blood products

- All transfusions from blood relatives.
- All HLA matched platelet concentrates.
- Intra-uterine transfusion (IUT).
- Exchange transfusion (ET) following IUT.
- Recommended for all exchange transfusions provided this does not lead to undue delay of the ET.
- Congenital immunodeficiency states (In some centres all blood for neonates is irradiated to avoid missing a congenital immunodeficiency)
- All recipients of allogeneic bone marrow transplants (BMT) or peripheral blood stem cell transplants from the time of initiation of conditioning chemo/radiotherapy. This continues while patient is on GVHD prophylaxis or lymphocytes $> 1 \times 10^9/L$.
- Patients undergoing stem cell harvesting for later autologous re-infusion.
- All patients with Hodgkins Disease.
- Patients treated with purine analogue drugs.

Where there is a particular risk from hyperkalaemia (IUT, ET), it is recommended that red cells (usually whole blood in these cases) be transfused within 24 hours of irradiation.

Paediatric Blood Product Array



Product	Indication	Volume	Special Precautions / Notes
Paediatric Whole Blood Leucocyte Poor	Exchange transfusion in neonates.	263 ±53ml	Clotting factor and platelet function deteriorate rapidly with storage.
Paediatric Red Cell Concentrate Leucocyte Poor	Neonates on Low Donor Exposure Programme. Where multiple transfusions are expected. Low birth weight (<1500g). Indicated for anaemia, top-up transfusion, haemorrhage, exchange transfusion.	87.5±62.5ml	Potassium levels increase rapidly with storage. 2.3 DPG levels deteriorate rapidly with storage. Administer within 5 hours depending on patient tolerance. Do not exceed 5ml/kg/h for a top-up transfusion.
Infant Red Cell Concentrate Leucocyte Poor	Neonates on Low Donor Exposure Programme. Where multiple transfusions are expected. Low birth weight (<1500g). Indicated for anaemia, top-up transfusion, haemorrhage, exchange transfusion.	87.5±62.5ml	Potassium levels increase rapidly with storage. 2.3 DPG levels deteriorate rapidly with storage. Administer within 5 hours depending on patient tolerance. Do not exceed 5ml/kg/h for a top-up transfusion.
Paediatric Platelet Single Donor	Infants with thrombocytopenia.	130±30ml	Transfuse within 15-30 minutes.
Infant Apheresis Platelet	Infants with thrombocytopenia.	50±10ml	Transfuse within 15-30 minutes.



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Product	Indication	Volume	Special Precautions / Notes
Paediatric Plasma-Fresh Frozen	Replacement of inherited single factor deficiencies. Multiple coagulation factor deficiencies in the presence of active bleeding and abnormal coagulation screening tests. Thrombotic thrombocytopenic purpura (TTP) (Preferably use cryo-poor plasma). Reversal of Warfarin effect. Vitamin K deficiency associated with Scoline Apnoea.	130±30ml	Paediatric use: Haemorrhage Disease of the Newborn: use FFP and Vitamin K intravenously. FFP contains physiological levels of all clotting factors. There is no justification for use of FFP in hypovolaemia, plasma exchange procedure (except TTP), nutritional support and protein losing states.
Leucocyte Poor Paediatric Fresh Frozen Plasma	Replacement of inherited single factor deficiencies. Multiple coagulation factor deficiencies in the presence of active bleeding and abnormal coagulation screening tests. Thrombotic thrombocytopenic purpura (TTP) (Preferably use cryo-poor plasma). Reversal of Warfarin effect. Vitamin K deficiency associated with Scoline Apnoea.	75±20ml	Paediatric use: Haemorrhage Disease of the Newborn: use FFP and Vitamin K intravenously. FFP contains physiological levels of all clotting factors. There is no justification for use of FFP in hypovolaemia, plasma exchange procedure (except TTP), nutritional support and protein losing states.
Fresh Frozen Plasma Low Titre Anti-T	Used for the treatment of neonates who is Crypt antigen positive.	260±60ml	Paediatric use: Haemorrhage Disease of the Newborn: use FFP and Vitamin K intravenously. FFP contains physiological levels of all clotting factors. There is no justification for use of FFP in hypovolaemia, plasma exchange procedure (except TTP), nutritional support and protein losing states.
Cryoprecipitate Low Titre Anti-T	Used for the treatment of neonates who is Crypt antigen positive.	7±1ml	Contains Factor VIII/vWF(+/-100i.u.), fibrinogen(+/- 200mg), fibronectin, Factor XIII.
Anti-Haemophilic Factor	Treatment of FVIII deficiency (Haemophilia A). Also of use in von Willebrand factor.	250 IU 500 IU	Does not contain therapeutic concentrations of fibrinogen.
Human Albumin 20%	Expansion of blood volume in patients with shock. Replacement fluid following paracentesis. Therapeutic plasma exchange. Treatment of protein loss in patients with extensive burns. In some selected cases of nephrotic syndrome.	50ml	Contra-indications include malnutrition, cirrhosis, chronic nephrotic syndrome.
Stabilised Serum	Volume replacement in initial stages of shock and hypovolaemia, where the replacement of clotting factors is not required. May be used in hypoproteinaemia and in burns.	50ml	Recommended dosage for children: 3-6ml/kg/day

Should you require gamma-irradiated blood / blood products or wish to enlist your patient(s) on the “Low Donor Exposure Programme” contact your local Blood Bank on the details listed below.

Red Cross War Memorial Children’s Hospital Blood Bank

Tel: 021 6891118, 021 6899273, 021 6899722

Tygerberg Hospital Blood Bank

Tel: 021 9311518, 021 93180825, 021 9384900, 021 9384901



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Groote Schuur Hospital Blood Bank

Tel: 021 4044091, 021 4044092, 021 4471443

Medicity Vergelegen Blood Bank

Tel: 021 8509138, 021 8521400

Paarl Blood Bank

Tel: 021 8711030

Worcester Blood Bank

Tel: 023 3422450

George Blood Bank

Tel: 044 8742074

Biohazardous Risk Management

(Revised from Blood Bank Notice)

Laboratory workers are exposed to many hazards and safety precautions are thus instituted to minimize the risks to staff. The WPBTS facilitates this process by instituting precautionary measures with the issuing of all blood products in hampers along with green stoppers. The stoppers should be inserted into the opened port of the used blood pack to prevent leakage. Ward staff are encouraged to remove needles and sharps prior to return to the Blood Bank. Please bear in mind, blood hampers which are received with major blood spillages or sharps attached to packs will be returned to the ward for investigation and cleaning.

Tests performed during an Adverse Reaction Investigation

The use of blood and blood products can result in a transfusion reaction. Reactions are usually reported telephonically to staff in the Blood Bank Laboratory. Special cases may be reported to the Medical Director or Medical Officer.

Upon receipt of the specimens and blood units the patient's post-transfusion serum or plasma is inspected for evidence of haemolysis. The patient's pre- and post- transfusion samples together with the suspect donor pack(s) are ABO and Rh typed. A direct-antiglobulin test is performed on the pre- and post-transfusion samples. If possible, a total serum bilirubin check is performed on the pre- and on all post-transfusion specimens. The returned blood units are inspected for any abnormalities. A visual check and strip test is performed on the urine sample. A clerical check is performed to ascertain that no clerical error has occurred. If required, a major or minor compatibility test is conducted.

In an effort to eradicate haemolytic reactions as a result of incorrect product administration due to clerical errors, the WPBTS evaluates ALL documented reactions. The results of the investigation and any clinically significant findings are reported immediately to the treating physician followed by a written report which is kept in the patient's folder. If a delayed haemolytic transfusion reaction is detected or suspected, tests are performed to determine and confirm the cause of the reaction.