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Infant Exchange Transfusions - Royal Oak Blood Bank

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

This document is to provide policies and procedures that will be applied when preparing blood for exchange transfusion of infants from birth through one year old.

II. CLINICAL SIGNIFICANCE:

A. Group O, Rh(D) compatible red blood cells (RBCs) are resuspended in group AB plasma by the Blood Bank. The combined RBCs and plasma product is simultaneously infused as the infant's blood is withdrawn. The exchange is performed by a manual method (push-pull method or isovolumetric method).

III. SCOPE:

This document applies only to infants **from birth through one year old**. Exchange transfusion of these infants may be indicated in cases of hemolytic disease of the newborn and/or hyperbilirubinemia. Occasionally an exchange transfusion is used to eliminate toxins, drugs, or other chemicals when they have been administered to the mother near the time of delivery, when toxic doses have been administered to the infant, or if they accumulate at high levels in the infant as a result of prematurity and/or an inborn error of metabolism.

IV. DEFINITIONS/ACRONYMS:

A. BBIS: Blood Bank Information System

B. CMV: Cytomegalovirus

C. Special transfusion requirements: a patient's need for a component that has been modified or that contains special attributes; i.e., irradiated or antigen negative.

D. FFP: Fresh Frozen Plasma ; plasma that has been frozen within 8 hours of phlebotomy.

E. FP24: plasma that may be frozen up to 24 hours after phlebotomy.

F. RBC: Red blood cell product

G. Thawed plasma: refers to thawed FFP or FP24 (more than 24 hours after thawing) that has an expiration date of 5 days from the time of thawing. Thawed plasma may have a reduced concentration of Factors V and VIII.

H. THAW24: refers to the modification code used in the Blood Bank Information System for thawing plasma to be used for a neonate. The thawed plasma will have an expiration date/time of 24 hours post thaw.

V. POLICIES:

A. **Selection of the RBC Unit used for Infant Exchange Transfusion**
A standard neonatal RBC unit should be used for all infant exchange transfusions. The RBC unit should be

1. **fresh (less than 8 days old if possible)**
2. Irradiated
3. Group O
4. Rh negative
5. Leukocyte Reduced
6. CMV Negative
7. Hemoglobin S (Sickle Cell) negative

B. **Compatibility Testing with the RBC Unit used for Infant Exchange Transfusion**

1. **Red cells selected for exchange transfusion of a neonate must always be compatible with the mother, and negative for the antigen against any clinically significant antibodies detected/ present in either the neonatal or maternal record. These RBC should be crossmatched in the same manner as they would be for the mother.**
2. If the exchange transfusion is due to anti-D, order group O Rh negative blood; if for any other antibody(ies), order a group O red cell negative for the corresponding antigen(s).
3. Red cells for exchange transfusion must be fresh **(<8 days old, if possible)**, leukoreduced, group O, CMV negative, irradiated, and either Washed (this is the normal process if time permits) or collected in citrate phosphate dextrose (CPD) anticoagulant.
    a. Normal inventory red cells with adenine-saline (AS-1 or AS-5) solution have excessive amounts of mannitol and are not suitable for exchange transfusion without washing.
4. For neonates (less than four months old), refer to Transfusion Medicine policy, Neonatal Compatibility Testing Guidelines.
    a. **If there is no history of maternal antibodies a serological crossmatch is not necessary and a Neonatal Assignment crossmatch Test ID (NEO) should be resulted in the BBIS.**
5. For infants greater than four months old and less than one year old, policies and procedures outlined in Transfusion Medicine policies, RBC Crossmatch Guidelines apply.

C. **Policies relating to the Plasma used for Infant Exchange Transfusion**

1. Group AB plasma must be used.
2. Plasma that has been thawed in the 24 hours preceding dispense must be used to reconstitute the RBCs for an infant exchange transfusion.

a. **A freshly thawed unit of AB fresh frozen plasma will be used that has been modified in the BBIS using the "THAW24" modification code.**

b. This policy was adopted to ensure that the plasma used for neonatal transfusion is freshly thawed within 24 hours. Plasma that has been thawed for greater than 24 hours may have a reduced concentration of Factors V and VIII.

D. **Calculation used to Determine the Weight of Plasma to Add to the Washed RBC Unit**
Determine the weight of thawed plasma to add to the washed RBC unit by using the following calculation and the values in the table below; an example is included.

Variable	Description of Value	Example
W	The weight of thawed plasma that will be added to the washed RBC unit.	The calculation indicates that W = 69 g.
X	The desired hematocrit of the final reconstituted product. This value will be obtained from the neonatologist.	55%
Y	Net weight of the washed RBCs (see step 5 of the Procedure)	210 g
Z	The hematocrit of the washed RBC unit (obtained from the STAT Lab; see step 4 of the Procedure)	73%

W = ((Z / X) – 1) (Y)
W = ((73 / 55) – 1) (210g)
W = (1.327 - 1) (210g)
W = (.327) (210g)
W = 69 g

E. **Expiration Date / Time of the Reconstituted Component (Pooled Plasma with RBCs) Used for the Infant Exchange**

1. The expiration date / time of the reconstituted component shall be the shorter of:
   a. 24 hours from the time that the RBCs were washed; see step 3 of the Procedure, or
   b. The expiration date / time of any of the original components that were pooled together to make the reconstituted component.

F. **Documentation on the Infant Exchange Transfusion Worksheet**
The *Infant Exchange Transfusion Worksheet* will be used to document the preparation of the pooled product and will be submitted for supervisory review by a Medical Technologist Lead/Supervisor.

G. **Documentation of all Welds/Seals**

1. All welds made with the sterile connection device must be inspected for proper alignment. Once the weld is opened, the tubing is inspected for leakage.
2. All seals made with the heat sealer must be inspected for leakage.
3. These inspections are documented on the *Infant Exchange Transfusion Worksheet*.

VI. SPECIMEN COLLECTION AND HANDLING:

Both a neonatal and maternal sample (if available) will be tested. All samples must meet the requirements found in the Transfusion Medicine Policies Triaging and Identifying Acceptable Samples for

Testing and Forward Typing Determination of Neonatal ABO and Rh for Patients Less than Four months of Age by Tube Method.

A. **Neonatal Sample Requirements:**
    1. Samples may be a capillary sample or may be drawn into an EDTA tube, with affixed identifying label.
    2. Cord blood samples are unacceptable for transfusion purposes.
B. **Maternal Sample Requirements:**
    1. The specimen of choice is 6 ml EDTA sample with affixed identifying label.
    2. Samples drawn in serum separator tubes are generally not acceptable.

VII. EQUIPMENT/SUPPLIES:

A. Heat sealer
B. Terumo BCT TSCD® II Sterile Tubing Welder (Primary device)
C. Terumo BCT SCD® 312 Sterile Tubing Welder (Backup device)
D. Plasma Bath
E. Digital Scale
F. Safety Glasses/Shield
G. Hemostats or clamps
H. Transfer tubing
I. Transfer bags
J. Supplies needed to wash RBCs, refer to applicable SOP.

VIII. QUALITY CONTROL:

Quality Control must be performed on day of use for the following:

A. Digital Scale
B. Weld acceptability on the Sterile Connecting Device (each instant of use)

IX. PROCEDURE:

A. Before you get started

1. Obtain the following information from the patient's physician:
    a. The name and extension of the physician or registered nurse (RN) who will be our main contact during product preparation.
    b. The time at which the infant exchange transfusion will be performed; this time and the expiration time of the reconstituted whole blood must be considered.
    c. The total volume of reconstituted whole blood requested for transfusion to the infant. An additional 60 mL will be added to this volume to account for dead space in the transfusion tubing. Note: Depending on the volume desired it may be necessary to reconstitute more than one unit in order to

obtain the required volume of reconstituted whole blood, for example if a double exchange is requested for the infant.

d. The desired hematocrit of the final reconstituted product. If the physician is unsure of the desired hematocrit then ask him or her whether a hematocrit of approximately 55% is acceptable, which is typical for an infant exchange transfusion. Note that the desired hematocrit is used *to* determine the weight of plasma to add to the RBC Unit.

B. Preparation of Blood for Neonatal Exchange Transfusion

1. Obtain a fresh unit of RBCs (less than 8 days old if possible) and complete any required compatibility testing with the unit.
   Refer to the above policies, *Selection of the RBC Unit used for Infant Exchange Transfusion*, and *Compatibility Testing with the RBC Unit used for Infant Exchange Transfusion.*

   Note: If unexpected antibodies are detected present/in either the neonatal or maternal record (current or historical) then the RBC must be negative for any clinically significant antibodies and should be crossmatched in the same manner as they would be for the mother.
2. Irradiate the RBC unit if not already done; modify the RBC in the BBIS to reflect irradiation.
   Refer to Transfusion Medicine Policies, Irradiation of Blood Components Using the RadSource RS3400 Blood Irradiator and SafeTrace (Blood Bank) Application
3. Wash the entire unit of RBCs. Document the washing on the *Washed Red Blood Cells Processing Log.*
   Refer to Transfusion Medicine Policy, *Washing and Deglycerolizing Red Blood Cells*.
4. Transfer the contents of the RBCs from the round processing bag to a 600 or 1000 ml transfer pack and obtain the hematocrit as follows:

a. Make sure the round processing bag of RBCs is well-mixed.	
b. Insert the spike of the empty transfer pack into the port of the round processing bag containing the RBCs. Document the transfer pack on the *Washed Red Blood Cells Processing Log.*	washed rbc transfer image 1.png
c. Allow the RBCs to flow from the processing bag to the transfer pack; leave some **well-mixed** RBCs in the segment (between the processing bag and the transfer pack).	washed rbc transfer image 2.png
d. Use the heat sealer to remove this segment. Make sure to leave enough tubing on the transfer bag for the pooling process.	
e. Label a plastic test tube with the donor number, **cut the segment**, and empty the contents of the segment into the tube. Do not squeeze the RBCs out of the segment, and do not use a segment splitting device!	washed rbc transfer image 3.png
f. Take this tube to STAT Lab and ask for a hematocrit of the washed unit. Label the printout obtained from STAT lab with the donor unit number.	

5. Determine the net weight of the RBC. Refer to Transfusion Medicine policy, Weighing Blood Products.

1. The net weight = the total weight (including weight of bag) minus the weight of an empty bag (approximately 30 g for a 600 ml pack, or 40 g for a 1000 ml pack).

6. Modify the RBC in the BBIS to reflect the washing. During this step, manually update the volume and expiration date/time of the washed unit. Select the option to print a full unit label before accepting the unit modification. Refer to Transfusion Medicine Policies, *Washing and Deglycerolizing RBCs* and SafeTrace (Blood Bank) Application
7. If multiple RBCs were washed at the same time, order and perform a unit confirmation type (RBCCON1) in the BBIS; refer to the Policy to Perform confirmation type after Washing and Deglycerolizing RBCs in Transfusion Medicine Policy, *Washing and Deglycerolizing Red Blood Cells*.
8. Calculate the weight of plasma that will be used to reconstitute the RBCs.
    a. See *Calculation used to Determine the Weight of Plasma to Add to the Washed RBC Unit* in the *Calculations* Policy above.
    b. Document this calculation on the *Infant Exchange Transfusion Worksheet.*
9. **Select and thaw a unit of AB fresh frozen plasma.**
    a. Refer to *Policies relating to the Plasma used for Infant Exchange Transfusion* near the beginning of this document.
    b. **In the Modification Batch in the BBIS, modify the plasma using the "THAW24" modification code.**
    c. **Verify the ISBT label and save for labeling the reconstituted whole blood product.**
10. Select the washed RBC and freshly thawed plasma under the appropriate product orders for the patient in the BBIS.
11. Use the sterile connection device to attach a transfer pack to the thawed FFP. Refer to Transfusion Medicine Policy, Sterile Connection Device - Operation, Quality Control & Maintenance.
12. Divide the unit of plasma into 2 bags. Refer to Transfusion Medicine Policy, Aliquot Preparation. Document the division on the *Blood Product Division / Aliquot Preparation Log.*
    a. Plasma Bag 1: contains the plasma that will be used to reconstitute the washed RBCs (weight was calculated in step 8). Make sure to leave enough tubing attached to the plasma bag for the pooling process.
    b. Plasma Bag 2: contains the remainder of the plasma.
13. Modify the plasma in the BBIS to reflect the division.
14. **Reprint a 2nd ISBT label for Plasma Bag 1. (This label will be used in final labeling of the reconstituted product in Step 16 below.)**
15. Physically pool the RBC and plasma bag 1 as follows:

a. Use the sterile connecting device to connect the washed RBCs and the aliquot of plasma. If the Terumo BCT TSCD® II sterile connecting device cannot be used, then a wet to wet weld is not possible, and transfer tubing must be used. Document the SCD wafer lot # or transfer tubing manufacturer and lot # on the *Infant Exchange Transfusion Worksheet*.	pool products image 1.png
b. Allow the contents of plasma bag 1 to flow into the transfer pack	pool products image 2.png

containing the washed RBCs.	
c. Use the heat sealer and remove the empty plasma bag 1 from the transfer pack containing the pooled RBCs and plasma. Document the inspection of the seal on the *Infant Exchange Transfusion Worksheet*.	pool products image 3.png

16. **The new pooled product now has a new expiration date and time. Refer to Policy, *Expiration Date / Time of the Reconstituted Component (Pooled Plasma with RBCs) Used for the Infant Exchange* above to calculate. Update the expiration of the appropriate product(s), as necessary, in BBIS to the new expiration date /time.**
    a. **Inventory Search > Product ID.**
    b. **Click *More Details* drop down.**
    c. **Click *Edit Component* button.**
    d. **Update the expiration.**
    e. **Reprint and Verify Product Label.**
17. **Add a note in the BBIS to the RBC component information stating, "RBC reconstituted with [FFP unit number and product code]".**
18. **Labeling: In addition to the existing RBC labels on the now pooled unit, label the back with the FFP ISBT label for plasma bag 1 retained in Step 14.**
19. **Assign the FFP unit and washed RBC unit with appropriate crossmatch (serological vs NEO) to the patient in the BBIS.**
    a. **Transfusion tags should print for the washed RBC unit and for the FFP aliquot.**
    b. **Attach both transfusion tags to the reconstituted product.**
    c. **When issuing, both the washed RBC and the FFP aliquot will need to be issued in the BBIS.**
20. Complete the Infant Exchange Transfusion Worksheet, and staple it to the hematocrit results of the unit. Submit these to the Lead Medical Technologist /Supervisor for review.
21. If necessary, repeat all steps of the Procedure to obtain the final volume of reconstituted whole blood requested by the patient's physician.

X. REFERENCES:

1. AABB, *Technical Manual*, current edition.
2. AABB, *Standards for Blood Banks and Transfusion*, current edition.
3. College of American Pathologists, *Transfusion Medicine Checklist*, current edition.

Attachments

Infant Exchange Transfusion Worksheet RO (revised 10/18/24)


pool products image 1.png


pool products image 2.png

pool products image 3.png

washed rbc transfer image 1.png

washed rbc transfer image 2.png

washed rbc transfer image 3.png

Approval Signatures

Step Description	Approver	Date
	Ann Marie Blenc: System Med Dir, Hematopath	10/26/2024
	Kristina Davis: Staff Physician	10/25/2024
Policy and Forms Steering Committe (if needed)	Kelly Sartor: Mgr, Division Laboratory	10/22/2024
	Kelly Sartor: Mgr, Division Laboratory	10/21/2024
	Kelly Sartor: Mgr, Division Laboratory	10/21/2024

Applicability

Royal Oak