Neonatal Transfusion Practices

Several e-network members have submitted questions pertaining to neonatal transfusion practices. Here are two such examples:

1. **A medical quality manager from North Carolina** requests information regarding the practice of **irradiating blood products** for NICU babies weighing less than 1200 grams, in order to avoid a risk of graft-versus-host disease.

2. **A blood banker in Massachusetts** reports that her facility currently transfuses infants with either CPD, washed or deglycerolized RBCs. She wants to know what are the **arguments for or against transfusing AS-1, AS-3 or AS-5 RBCs** to infants and what is the practice in the field?

Editor's note #1: **Dr. Cathy Litty, the Director of Transfusion Medicine at St. Christopher's Hospital for Children in Philadelphia**, presented an ASCP Spring 2002 teleconference entitled "Transfusing Children: What's the difference?" During that conference she reported that **transfusion of neonates with AS-1, AS-3 and AS-5 RBCs was safe and possibly preferable to using CPD or CPDA-1 RBCs, in terms of less risk of transfusion associated hypoglycemia**. She explained that in her opinion, when hypoglycemia is seen in association with transfusion, the usual cause is the interruption of the administration of high dextrose solutions whenever one would start up transfusion of low dextrose CPD or CPDA-1 RBCs. She also **downplayed the infusion of other constituents of AS products, such as mannitol**. She reported that using plasma-depleted (washed or deglycerolized) RBC would only be indicated for larger volume transfusions, such as whole blood exchanges or ECMO. However, she added that even for the prime of their ECMOs, they use additive solution units. Finally, for replacement transfusions, they do not limit the age of the transfused RBC units to 10 days or less, to allow a baby to be transfused with multiple aliquots from the **same** RBC unit. On the other hand, they do try to keep the blood used for large volume transfusions **under 10 days old**, if possible, to minimize the amount of potassium administered to the baby.

Editor's note #2: The e-network may find an earlier e-Network forum issue (on potassium toxicity) to be germane to the discussion about irradiated blood for neonates. In addition, in the UCLA Transfusion Medicine Manual (*currently unavailable during revision*) in chapter 7, section entitled IRRADIATED BLOOD PRODUCTS FOR PREVENTION OF TRANSFUSION-ASSOCIATED GRAFT-VERSUS-HOST DISEASE, TABLE 7-2 states the following .

Risk Groups for Transfusion-Associated GVHD -

Risk Well Defined

- Bone marrow transplant recipients
- Congenital immunodeficiency syndromes
- Intrauterine transfusions
- Transfusions from blood relatives
- Premature newborns
- Neonates receiving exchange transfusion
- Patients receiving HLA-matched platelet transfusions
- Hodgkin's disease

Occasional Case Reports Documenting Some Risk

- Hematologic malignancies other than Hodgkin's Disease (acute leukemia, non-Hodgkin's lymphoma)
- Solid organ transplant recipients
- Solid tumors treated with chemotherapy or radiation therapy (neuroblastoma, glioblastoma, rhabdomyosarcoma, immunoblastic sarcoma)

NOTE: Surprisingly, TA-GVHD has **not** been reported to occur in individuals with AIDS even though it is recognized that such patients have severe immunodeficiency.

Prior to sharing the above questions with the full e-network forum, the **input of recognized experts in neonatal and pediatric transfusion practice was solicited**.

1. **A transfusion medicine physician in Iowa** reported that his hospital routinely/always uses AS-1, AS-3, or AS-5 RBC that are WBC-reduced. They have used this approach for 10 years or longer. Their practices are based on a review by Ron Strauss in Transfusion 2000;40:1528-1540. In addition, in relationship to the list of risk groups for acute GVHD, he thinks it is worthwhile to specifically mention patients receiving chemotherapy with the risk of acute GVHD with fludarabine.

2. **A transfusion medicine physician in Washington DC** disagreed with several opinions expressed by Dr. Litty. For example, the DC blood banker countered Dr. Litty's opinion that transfusion of neonates with AS-1, AS-3 and AS-5 RBCs is safe and preferable to CPD or CPDA-1 RBCs. The DC blood banker pointed out that if one uses additive solution RBCs for small volume transfusions, one needs to give a larger volume of blood to achieve the same post-transfusion hemoglobin increment, due to the lower red cell mass per ml in additive units. This can be a real problem for volume-sensitive tiny premies. Regarding Dr. Litty's opinion to downplay the infusion of other constituents of additive products, the DC blood banker commented about a **theoretical issue for premies who are sensitive to mannitol-induced diuresis**. According to the DC blood banker, when these neonates undergo diuresis, they can develop subarachnoid hemorrhage. The solute load is the critical issue, which is sodium driven, and exaggerated by mannitol. Regarding Dr. Litty's opinion that washed or deglycerolized RBC are indicated for large volume transfusions, such as whole blood exchanges or ECMO, the DC blood banker commented that depending on the reason for the exchange, the use of hard packed additive or CPD/CPD-A1 whole blood or reconstituted whole blood is preferred to using washed or deglycerolized RBCs. Washed and deglycerolyzed RBCs have no plasma proteins, can hemolyse when flowing through heaters and mechanical devices, unless there is an albumin wash of the circuit, and often require additional blood exposures due to loss of product in the washing/deglycerolization process. Finally, regarding the indications shown in the UCLA on-line transfusion service manual for **irradiated blood** for neonatal transfusion, the DC blood banker cautions that some experts would argue to **use irradiated blood products for any neonate who might have an underlying immunodeficiency disease** (e.g., those with complex congenital heart disease, those who have had a sibling with an unexplained death, etc.).

ADDENDA May 14, 2002

3. The data below is offered by a **blood bank physician** who is aware of neonatal transfusion practices in a New Jersey (N.J.) hospital and in a Chicago hospital, and has reported on the use of additive solutions and other practices for neonatal transfusions. Both hospitals are tertiary care and university-affiliated.

	N.J.	Chicago
AS RBC for 10 ml replacements	Yes	No
Age limit of RBC for 10 ml replacements	<20 d.	CPD for specific pt. to outdate
Irradiation of blood for premature neonates	<1500 gms	No
CMV Ab neg blood for premature neonates	<1500 gms	<1200 gms

ADDENDA Dec. 15, 2008

4. A **medical technologist who works at a small (less than 200 beds) hospital in a rural area of Texas** reports that for patients in their Neonatal ICU an exchange transfusion happens rarely, but RBC transfusions for preemie and term newborns happen frequently. Until recently, their hospital blood bank has been able to maintain an inventory of CPD-A1 RBC units for neonatal transfusions. However, their blood product provider no longer manufactures CPD-A1 RBC units and the inquiring colleague's hospital now has to **special order CPD-A1 RBC** from another supplier, but it **takes up to two weeks to fill** each special order. The inquiring colleague has read with interest the e-Network Forum comments on the subject of using (or not using) AS-RBC products for neonatal transfusion, but she cannot see that there is a clear consensus. She believes that **ADSOL-reduced or washed cells** are recommended for

exchange transfusions but that approach is **not a viable option** for her hospital. Her hospital is two hours away from their supplier (there are none closer) and their neonatologist feels that is too long to wait for their supplier to manipulate an RBC unit for them. Usually, it takes from **3-4 hours to get a STAT order** filled. They **don't have the equipment** to wash or even reduce the anticoagulant. Her question is: Since they only keep one or two units for these babies (a mix of term and preemies) **should the blood they keep on hand be irradiated** and **what anticoagulant is the best choice** in relation to mannitol, potassium and other constituents that may be harmful to these babies.

Please submit comments to the e-Network Forum.

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