



e-Network Forum

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Risk of hyperkalemia from irradiated Red Cells used to prime ECMO circuits in neonates

A colleague in Ohio has reviewed the e-Network Forum discussion "[Red cells for neonates on ECMO - Questions about the study by Eder et al. suggesting that additive RBC are as safe as CPDA RBC](#)" and its related links, but cannot find data describing the **potassium content of the supernatant of irradiated RBC's that are used to prime ECMO circuits**. Apparently, the neonatologists in his area are concerned that the ELEVATED potassium level of the supernatant of FIVE OR LESS DAY OLD, irradiated RBCs makes the direct infusion of these blood products risky, and so they are running the irradiated RBCs through a dialysis circuit prior to using them to prime the ECMO circuit. He wonders if others are also 'dialyzing' RBCs or taking any other precautions to remove potassium before using this product for ECMO.

The following comments have been received.

ADDENDA Jan. 11, 2005

1. **An ECMO Coordinator at an academic center in a Sunbelt state** reports that they use irradiated & leukoreduced RBCs for their ECMO procedures, as per their blood bank policy for neonatal blood products. Their **typical circuit setup** for ECMO treatment of a neonate is as follows:

The ECMO tubing pack is set up sterile, filled with CO₂ (for easier debubbling), and 1.5 liters Isolyte is added, circulated with the ECMO pump & debubbled. The tubing pack includes an oxygenator, blood heater & hemoconcentrator (they report that they currently use the Terumo-Capiox Pediatric Hemoconcentrator). Three units of packed cells, less than 5 days old, group-specific, are added to the circuit & circulated. One liter of Isotonic Saline with 50 mEq NaHCO₃ is added. 1.5-2 liters of fluid is removed via the hemoconcentrator. Sweep gases are added to the oxygenator (O₂, room air, CO₂). From this point on, blood gases, electrolyte panels, & Hct are checked & adjusted (with NaHCO₃, CaCl, etc) until desired results are obtained. This generally requires 2-3 lab panels. This method works well, as long as the blood is fresh (< 5 days old), and can be done rather quickly in emergent situations.

ADDENDA Jan. 14, 2005

2. **The Medical Director of a Pediatric Transfusion Medicine service in Massachusetts** reports that at his hospital they routinely use donor RBCs that are **no older than 7 days for priming ECMO circuits** and RBC units that are **no older than 14 days for adding blood to established ECMO circuits**. He reports that they have not had a problem with hyperkalemia using these units. In his experience, irradiating the units does increase the rate of potassium release from the stored erythrocytes and they do try to **minimize the time between irradiation and transfusion**. They have tested this with internal studies and have shown that supernatant potassium concentrations do not rise immediately after irradiation but do rise within hours after irradiation. The rate of rise of potassium concentration is relatively rapid for about 3 days following irradiation, after which it decreases to that seen with non-irradiated units. This holds true for both CPDA-1 and AS3 units. (They tested those products because they are the ones they routinely stock.)

ADDENDA Jan. 22, 2007

3. **A colleague at the Swiss Agency for Therapeutic Products** reports that a **recent adverse transfusion event** associated with a high potassium level in transfused RBCs triggered a policy change at a Swiss hospital to only **utilize RBC for ECMO that are no older than 5 days**. The hospital had used RBCs for ECMO that were **up to 7 days old**. However, since the change in policy they have adopted a 5 day limit based on published [British Guidelines](#), which in section 6.1 state that ECMO is comparable to exchange transfusion, and blood not older than 5 days is recommended for the exchange transfusion of neonates. The Swiss colleague laments that a strict 5 day limit on the age of RBCs will cause logistic problems, especially on Mondays. The inquiring colleague asks if there **are data available comparing potassium levels between 5 day and 7 day old RBCs?** If data

exist, **do they demonstrate a clear advantage** of using 5 day old versus 7 day old RBCs for ECMO?

4. **Editors' note:** The discussions:

- Red cells for neonates on ECMO - Questions about the study by Eder et al. suggesting that additive RBC are as safe as CPD/A RBC,
- How long may a primed ECLS/ECMO circuit run without a patient connected? and
- Comparison of CPDA vs. AS red cell transfusion to infants on ECMO (Poster presentation, ASCP/CAP Annual Meeting 2002)

are also germane to this question.

Please submit comments to the [e-Network Forum](#).



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Posted: November 29, 2004

Addenda: Jan. 11 & 14, 2005;
Jan. 22, 2007