**Long-Term Red Blood cell survival in Critically Ill Very Low Birth Weight Infants**

Denison J. Kuruvilla, John A. Widness, Peter Veng-Pedersen
University of Iowa

**Purpose:**

Premature births (less than 37 weeks of gestation) account for about 8-10 percent of all pregnancies in the United States. One of the primary causes for anemia of prematurity is the shortened RBC lifespan. The aim of the current study was to investigate the changes in the mean potential lifespan (MPL) of both transfused and fetal RBCs in preterm infants.

**Methods:**

Preterm infants (<29 weeks gestational age) were transfused with biotinylated RBCs and blood samples were analyzed for around 45 days post bio-RBC transfusion using the Sysmex XE-2100 flow cytometer. Transfused RBCs were assumed to be produced under steady state and have uniform distribution of ages. Hemoglobin (Hb) mass balance model was used to correct for the increase in blood volume due to infant growth, clinical transfusions and blood loss due to clinical tests. The mean potential lifespan was calculated for both the donor and the fetal RBCs. The model was assumed to have a single point distribution of cellular lifespans that does not vary over time (i.e. time invariant).

**Results:**

The MPL of the adult transfused RBC was estimated to be around 82 days. This is much shorter than the lifespan of the same cells in healthy adult humans. This indicates that the transfused RBCs have shorter survival in preterm low birth weight infants. If the fetal RBC lifespan is comparable to adult RBC estimates, then a better approach to overcome anemia of prematurity would be to try to stimulate the production of fetal RBCs by administering erythropoietin (EPO).

**Conclusion:**

Transfused RBCs have shorter lifespan in preterm low birth weight infants as compared to healthy adults. This indicates that RBC transfusions would be required to effectively control the infant Hb levels. If the fetal RBC lifespan is comparable to this shorter lifespan of transfused RBCs, then a better and safer approach would be to stimulate the production of fetal RBCs by optimal EPO dosing.