

Cord Blood Units Collected with Liquid CPD Appear to Contain Significantly More Nucleated and CD34+ Cells Than Units Collected with Dry Heparin.

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Transplantation of Cord Blood Stem Cells depends primarily on the number and potency of stem cells harvested, processed and cryopreserved. Previous studies have not compared the anti-coagulant used in collection systems with respect to their impact on the cord blood unit cell count and composition. We compared cord blood units collected in Citric Phosphate with Dextrose Buffer (CPD) or Heparin by measuring the pre-processed total nucleated cell count (TNC), post-processed TNC, % CD34 and total number of CD34+ cell numbers from units harvested randomly in remote hospitals in the US. Between August 2005 and May 2009, cord blood units harvested in collection bags containing lyophilized (dry) Heparin (N=65) and cord blood units harvested in FDA approved Sentinel collection bags containing 35 ml of CPD (N>6300) were processed using standard processing methods which included either RBC depletion or volume reduction based on initial collected volume. We observed significantly greater pre-processed TNC count ($9.59 \pm 5.98 \times 10^8$ Vs $7.36 \pm 4.96 \times 10^8$, $p=0.003$), post-processing TNC count ($7.72 \pm 4.61 \times 10^8$ Vs $5.80 \pm 3.63 \times 10^8$, $p=0.001$), % CD34+ (0.46 ± 0.28 Vs 0.37 ± 0.23 , $p=0.024$) and number of CD34+ cells ($2.72 \pm 2.73 \times 10^6$ Vs $1.72 \pm 1.44 \times 10^6$, $p=0.003$) in the CPD units. Interestingly, viability by dye exclusion was 7% higher ($p=0.0001$) in the post-processed Heparin units despite more pre-TNC (by 24%), post-TNCs (by 29%), and more %CD34+ (by 22%) and CD34+ cells (by 54%) in the CPD units. Post-processed CD34+ measurements relied upon gating to select live cells (by 7AAD exclusion) and reflect a decrease in viable CD34+ cells in Heparin units. Together, these results indicate that units collected using CPD contain significantly more TNCs prior to and after processing than units collected using Heparin. Furthermore, both the % CD34+ and total number of CD34+ cells were significantly lower in the Heparin containing units. Both TNC and CD34+ values are primary indicators of graft potency in clinical studies. Cord blood units collected in the pubic cord blood system and the vast majority of cord blood units used in clinical transplantation have been collected in CPD. CPD is both an anti-coagulant and a preservative as it contains Dextrose which provides a substrate for glycolysis and preserves the metabolism in cells. Heparin, which does not contain Dextrose to preserve cell metabolism, is rarely used as an anti-coagulant for blood collection, as it can only be useful for blood that is to be transfused within 12 hours of collection because it is broken down over longer periods of time. Also, the use of dry Heparin may adversely affect the osmolarity of the cord blood unit, thereby compromising cellularity. However, further studies are recommended to elucidate the mechanism by which dry Heparin may adversely affect the TNC and CD34 content of cord blood units.

Disclosures: Kraus: PerkinElmer/Viacord: Employment. Foster: PerkinElmer/Viacord: Employment. Bridges: PerkinElmer/Viacord: Employment. Walters: PerkinElmer/Viacord: Membership on an entity's Board of Directors or advisory committees.

Footnotes

* Asterisk with author names denotes non-ASH members.

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