Reduced Engraftment Times using the PremierMaxCB℠ Processing Methodology

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ABSTRACT

Following clinical trail participation to evaluate PrepaCyte®-CB, Lifeforce Cryobanks (LC) switched it's Cord Blood Unit (CBU) processing methods from traditional hetastarch to PrepaCyte-CB in mid-2008, and began using it exclusively in 2010. This change was intended to maximize stem cell recovery while depleting the CBU of red cells, resulting in a superior stem cell product vs. traditional methods.

In late-2008 LC switched from a home-made DMSO and Gentran cryopreservation solution to Cryostor-CS10® to provide superior cellular protection during the freezing and thawing processes as well as to evaluate the reduction of the final DMSO concentration from 10% to 5%. These changes in reagents, coupled together with individual sample QC, were branded as PremierMaxCB℠.

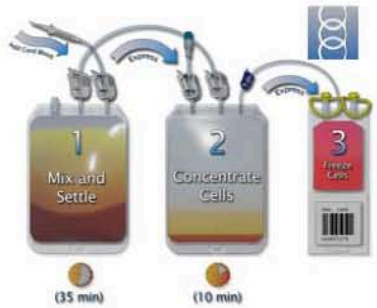
Post processing lab results of 2225 CBU processed with PremierMaxCB show increased recovery of TNC count (91.4%/84.8%), mean CFU results (20.4/ 11.7), and mean CD34+ count (5.7/4.9) and a markedly decreased hematocrit (7.8%/ 44.1%) vs. our traditional method. Viability data continued to be acceptable.

A retrospective evaluation was performed to further determine the clinical significance of the new processing method. Using outcomes data from the 8 PremierMaxCB-processed transplanted CBU, the mean neutrophil engraftment time is 11.8 days and the mean platelet engraftment time is 33.8 days. These times show a significant reduction when compared to the LC historical data (TNC – 22.0 days and plt – 51.2 days). Further, no adverse events or product-related infusion reactions have been demonstrated from PremierMaxCB processed CBU.

While the number of CBU transplanted is quite low, the data is encouraging and mimics that seen and reported by Regan, Donna, et.al. from St. Louis CBB using PrepaCyte-CB. Due to the significance of the preliminary findings, LC plans to continue to evaluate PremierMaxCB-processed CBU data.

BACKGROUND

LC has processed 2225 CBU using PremierMaxCB featuring PrepaCyte-CB and CryoStorCS10. The PrepaCyte kit is a 3-bag system with a pre-loaded reagent (bag 1) designed to remove red blood cells from CB without initial centrifugation. The resulting WBC-rich plasma is expressed into bag 2 leaving >98% of red cells as waste. The WBC-rich plasma is then centrifuged to concentrate the cells. Excess plasma is expressed back into bag 1 as waste. The remaining cellular concentration is then mixed with equal parts CryoStorCS10 and expressed into the final freezing bag for controlled rate cryopreservation.



METHOD & MATERIALS

A retrospective analysis was performed to evaluate patient outcomes post transplant and processing methodology.

Outcomes data used was provided by CIBMTR or direct reporting to Lifeforce Cryobanks

Patients without reported engraftment data were excluded

- PrepaCyte-CB processing reagent (CMDG, LLC)
- CryoStor CS10 cryopreservation reagent (BioLife Solutions)

RESULTS

CBU processed using PremierMaxCB showed a higher total nucleated cell count (TNC) recovery, mean CFU result, and mean CD34+ cell count.

The PremierMaxCB cohort showed a significant increase in red cell depletion as demonstrated by reduction in final hematocrit from 44.1% to 7.8%

There was no significant difference in viability shown between the 2 methods ($p<0.05$).

Time to PMN and platelet engraftment post transplant were significantly reduced in the PremierMaxCB cohort from 22 to 11.8 days and 51.2 to 33.8 days respectively. (Note: due to limited sample size, patient disease/stage, conditioning regimen, patient age and cell dose were not considered or evaluated.)

PremierMaxCB processed CBU contain less toxic DMSO (5%) than our traditional hetastarch processed CBU (10%).

	PremierMax CB	hetastarch
TNC recovery	91.4%	84.4%
CFU results	20.4 x 10^5	11.7 x 10^5
CD34+ count	5.7 x 10^6	4.9 x 10^6
Viability	96.7%	95.8%
hematocrit	7.8%	44.1%

RESULTS – continued

	PremierMax CB	hetastarch
Days to ANC 500	11.8	22.0
Days to plt 20,000	33.8	51.2

CONCLUSIONS

The PremierMaxCB processing methodology replicates previous laboratory and clinical data for the enhanced recovery of desired transplant characteristics from umbilical cord blood samples. Further, the ability to reduce toxic DMSO and residual red cells is far superior to historic methods. Most importantly, post transplant data shows a marked reduction in PMN and platelet engraftment times, albeit in a very small sample size.

Due to the potential reduction in hospital stay and patient morbidity/mortality, the reduced engraftment time is significant and MUST be monitored further to determine overall long-term significance.

PREMIERMAXCB

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Cord Blood Preservation and Stem Cell Bio-Technology

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