



# Hybrid Cord Blood Banks May Be Advantageous for Scientific As Well As Economic Reasons

Soumya Pandey, MD, Plummer Badger, RN, and Michele Cottler-Fox, MD  
 Department of Pathology  
 Cord Blood Bank of Arkansas, Little Rock, AR, USA



## BACKGROUND

Public cord blood banks have thresholds for accepting cord blood collections for processing based on economic models developed using surrogate markers of suitability, i.e. volume and total nucleated cell count (TNCC). Only after processing has it been possible to look at CD34+ cell numbers and colony forming units (CFU).

Since as few as  $0.52 \times 10^5$  CD34+ cells can be expanded in vitro and used successfully for transplant (Lancet Haematol 7(2):e134-e145, Nov 5, 2019;doi.org/10.1016/S2352-3026(19)30202-9), it is important to understand what is in the smaller collections that public bank guidelines currently prevent from being processed. Hybrid public/private cord blood banks permit economic support from the private bank to help support the public bank. They also offer an opportunity to evaluate products outside public banking thresholds because all collections are processed. Here we present data from 86 private cord blood unit (CBU) collections processed for the Cord Blood Bank of Arkansas (CBBA), showing the relationship between collection volume, TNCC and CD34+ cell numbers.

## METHODS

- The CBBA is a hybrid bank, providing cord blood banking for public, private and research use.
- Parents are informed of the different options for banking available, document their informed consent, and then receive a collection kit to bring to the delivering obstetrician.
- Cord blood is collected with the placenta in utero using Pall model # 791-08 collection kits.
- Collections are processed within 72 h of collection at a central site with plasma and red cells removed.

## RESULTS

Table 1. CBU variables  
 TNCC is pre-processing and CD34 is post-processing

N=86	Mean	Median	Range
Collection Volume (mL)	75.55	73	27-164
TNCC ( $\times 10^9$ /unit)	0.86	0.76	0.11-3.09
CD34+ cells $\times 10^6$	3.73	1.9	0.09-81
Viability (%)	94.66	95.5	83-99

Table 2. Correlation between collection volume and post-processing CD34+ cells

		Collection Volume (mL)		
		<60* (N=29)	60-100 (N=41)	>100 (N=16)
CD34 $\times 10^6$	Mean	1.52	2.93	9.8
	Median	1.39	2.63	3.22
	Range	0.09-3.84	0.15-9.25	1.31-81

\*Threshold

Table 3. Correlation between pre-processing TNCC and CD34+ cells

		TNCC ( $\times 10^9$ /unit)			
		<0.5 (N=19)	0.5-1 (N=39)	1-1.5* (N=19)	>1.5 (N=9)
CD34 $\times 10^6$	Mean	1.18	2.34	3.22	16.23
	Median	1.12	1.67	3.03	5.47
	Range	0.09-2.59	0.15-9.25	1.31-5.65	2.58-81

\*Threshold

## METHODS (CONTD.)

- Pre-processing TNCC are performed with a Beckman Coulter Ac.T Diff2 cell counter and TNCC determined as follows: actual cord blood weight  $\times$  WBC  $10^3/100$ =TNCC.
- Flow cytometry is performed using the ISHAGE technique with a Beckman Coulter CytoFLOW.

## RESULTS

- Mean maternal age was 33 years (range 24-45).
- Delivery route was spontaneous vaginal for 57 (66.27%) and caesarian section for 29 (33.7%) mothers.
- Of 86 CBU donated, there were 44 males, and 42 females.
- Mean birth weight was 3319.5 g (median 3331; range 2296-4337).
- Mean gestational age was 38.8 weeks (median 39; range 36-41.4).
- As noted in Table 1, mean collection volume was 75.5 mL, TNCC  $0.86 \times 10^9$ /unit, CD34+ cells  $3.73 \times 10^6$ , and viability 94.66%.
- Table 2 and 3 show that significant numbers of CD34+ cells were collected even below the threshold for accepting a public donation (collection volume <60 mL and TNCC < $1 \times 10^9$ /unit).

## CONCLUSIONS

Data on hematopoietic potential of low volume/low TNCC products are currently available only from a hybrid or private bank. Here we show that CBU below threshold TNCC and volume for public banks can have a significant number of CD34+ cells available for expansion and use in transplant.