MONITORING CORD BLOOD INVENTORY RELIABILITY BY KEY QUALITY INDICATORS AT AND AFTER RELEASE

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Abstract #
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No relationships to disclose.

INTRODUCTION

As per FACT standards, Cord Blood Banks (CBB) have to verify that they provide a safe and effective product for transplant.
Validated processing methods and storage conditions are the first steps towards this goal, but what are the final steps to monitor the quality of the cord blood units (CBU) released for transplant?
We present here a retrospective analysis of our Program's final verification process.

A. Segment Analysis (n=550)

550 CBU had a segment tested for QC at shipment.
Testing included:
- Total nucleated cells (TNC), using a Sysmex XE-2100 analyzer;
- Viable CD34 cells, by flow cytometry (single platform flow cytometry using ISHAGE strategy and 7- AAD for viability);
- Colony forming units (CFU).

Table 1: Post-thaw segment QC results

Criteria	NCBP results	FACT requirements
CD34 viability (n=777) (a)	95.27% (37.75 – 100)	> 70%
TNC recovery (n=550)	83.35% (42.6 – 128.6)	-
viable CD34 recovery (n=550)	64.90% (14.5 – 134.7)	-
CFU recovery (n=516) (b)	60.94% (10.6 – 155.8)	Growth

(a) 777 segments were assessed for CD34 viability (227 CBU were preserved into 2 bags, 323 CBU into one bag)
(b) 516 CBU were assessed for CFU recovery (34 CBU had not post-processing CFU testing)

CBU shipment (n=618)

618 were CBU shipped between January 2018 and December 2022.

B. Patents characteristics for infused CBU (n=544)

544 CBU had an infusion date reported to CIBMTR.

Table 2: Patient's characteristics for infused CBU

Adults		321 (59%)
Children		223 (41%)
Diagnosis	Malignant disease	472 (87%)
	Non Malignant disease	72 (13%)
Single		331 (61%)
Multiple	Double CBU	184 (34%)
	CBU + PBSC	26 (4%)
	>3 CBU	3 (1%)
Match	3/6	2 (0.4%)
	4/6	316 (58.1%)
	5/6	184 (33.8%)
	6/6	42 (7.7%)
CBU storage time (average, range)		7.5 years (7 months – 19.5 years)
Cell doses	TNC x10e7/kg (median, range)	3.4 (0.7 – 56.7)
	CD34 x10e3/kg (median, range)	205 (16 – 4856)

C. Engraftment analysis (n=250)

250 CBU had engraftment data reported to CIBMTR.
96.8% of patients engrafted.

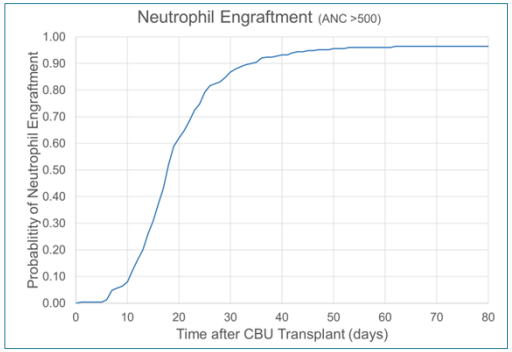

Figure 2: Neutrophil Engraftment

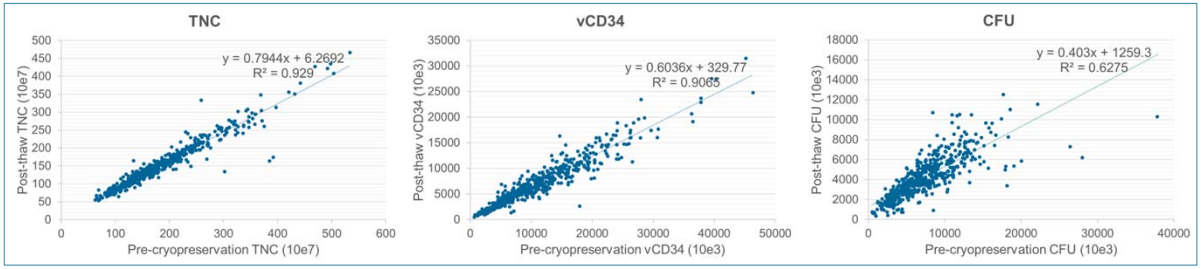

Figure 1: Correlation between pre-cryopreservation and segment post-thaw QC results

→ *Outside of acceptance criteria - Engraftment*

Non engraftment: n=8

Non engraftment triggers a review of manufacturing, distribution and testing data of the CBU, as well comparison with engrafted units.

No issues identified with CBU.
No difference with engrafted CBUs when comparing post-thaw segment viability and recovery data.

QC done at shipment; values within acceptable range (n=7)

QC done prior to shipment (at the time of confirmatory typing, 4 years prior); values within acceptable range (n=1)

→ *Outside of acceptance criteria – QC testing*

CD34 viability <70%: n=6

Low viability events trigger an extensive review of manufacturing and distribution data of the CBU, as well as repeat testing of the flow cytometry.

For all 6 CBU, repeat testing resulted in similar values; no issues were identified during data review and investigation pointed towards a technical problem at the time of thaw, with no root cause identified.

CBU cryopreserved in 2 bags (n=3) → Second bag within expected range (n=3) → Infused (n=3) → Patient engrafted (n=2); No outcome data (n=1)

CBU cryopreserved in 1 bag (n=3) → Infused (n=1) → No outcome data (n=1); Infusion pending (n=1); Not infused (n=1) (back up CBU infused)

CFU no growth: n=0

CONCLUSION

Our QC results confirm the continued stability of the CBU until shipment. The small subset of CBU with out of specification results were linked to technical issues and did not affect the outcome of transplant.
Outcome data is another way of assessing the quality of the CBUs, even though it may be influenced by many factors out of the CBB's responsibility (such as diagnosis, conditioning, multiple transplants, etc…).
The combined analysis of the two datasets is a good way for a CBB to ensure processes are performing as expected over time and monitor the quality of the final product.