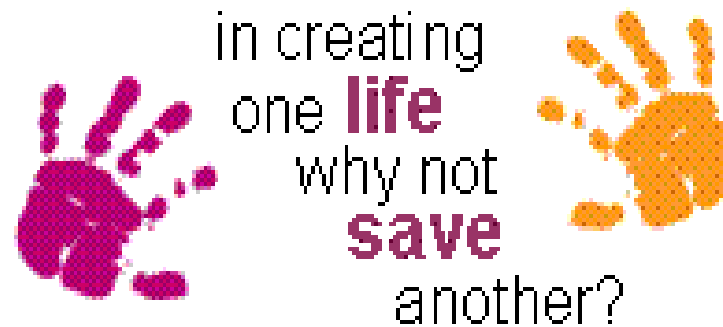


# The Impact of Maternal, Neonatal and Collections factors on the TNC count of an Umbilical Cord Blood Donation



By: NHS Cord Blood Bank (Colindale Laboratory)

Date: 26<sup>th</sup> September 2014

# NHS Cord Blood Bank

Cord blood (CB) is a life saving waste product, it is the blood that remains in the placenta and umbilical cord after child birth and is rich in haematopoietic stem cells.

CB is used as an alternative product to bone marrow and PBSC's in stem cell transplantation.

The NHS CBB collects cord blood at 6 hospital sites. We have been operational since 1996.

20, 441 units in the bank

Barnet General Hospital,  
Watford General Hospital,  
St. George's Hospital,  
University College Hospital,  
Luton and Dunstable Hospital  
Northwick Park Hospital



## NHS Cord Blood Bank - Collection

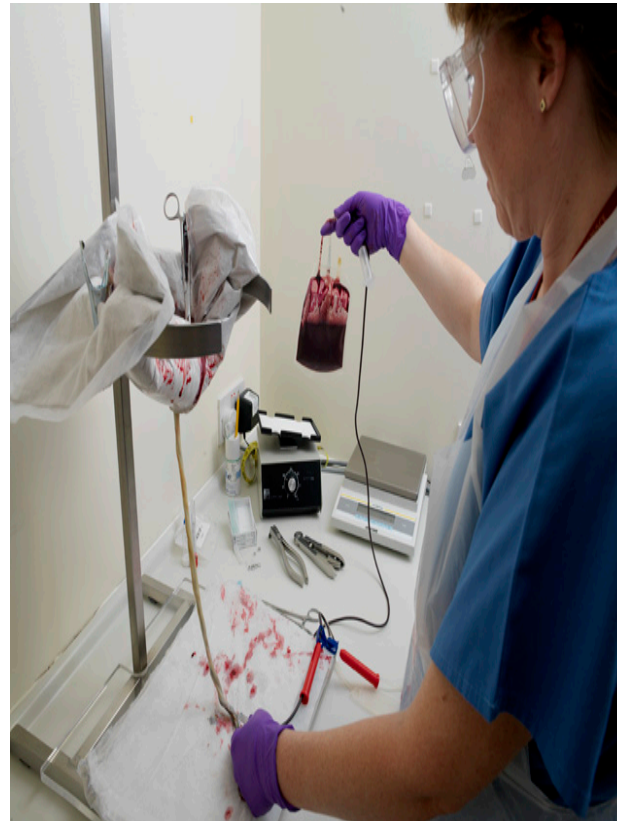
6 collection sites

24/7

Dedicated  
collection room

Ex utero collection

No interference  
with obstetric care



- Cord double clamped and cut
- Suspended in collection stand
- Collected into a 250 ml collection bag by the force of gravity
- Weighed and labelled
- Under 50 ml – Discarded
- Over 50 ml – Evaluated

# NHS Cord Blood Bank

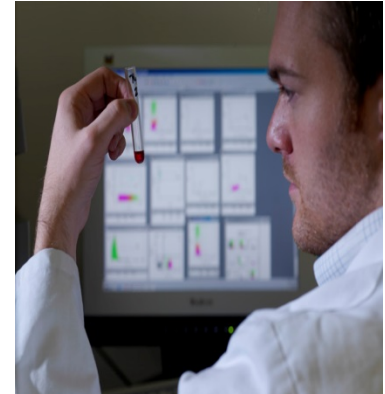
Evaluated to determine a TNC count.

$>140 \times 10^7 \rightarrow$  processed and banked.

$120 - 140 \times 10^7 \rightarrow$  CD34+ve count  
( $>3.2 \times 10^6$  are processed and banked)

$<120 \times 10^7 \rightarrow$  discarded/issued for R&D.

Units that pass evaluation are volume reduced, cryopreserved and stored in our processing laboratory in Bristol.



# NHS CBB Units Issued for Transplant

Issued **502** for transplant

447 of the 502 issued (89%) →  
TNC at collection of  $>120 \times 10^7$

Since 2010,  
202 of the 217 issued (93%)  
→ TNC at collection of  $>120 \times 10^7$

Average TNC at collection of the 502 CBUs  
issued is  $195.4 \times 10^7$

Clinical outcome is greatly influenced by  
TNC count – strong association with speed  
of engraftment.



Harvey, age 4, diagnosed with Hurlers syndrome at 9 months old. A life saving CBT was performed after enzyme therapy.



Hollie, age 3, received a CBT after a diagnosis of ALL at 6 months old.



# Study Details

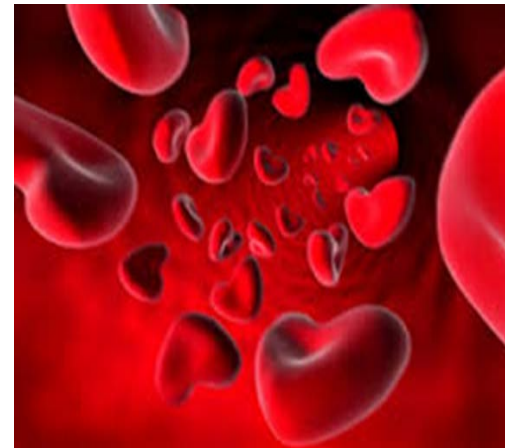
To investigate the maternal, neonatal, obstetric and collection factors that contribute to the quality of the umbilical cord blood (UCB) unit.

High quality unit = Banked

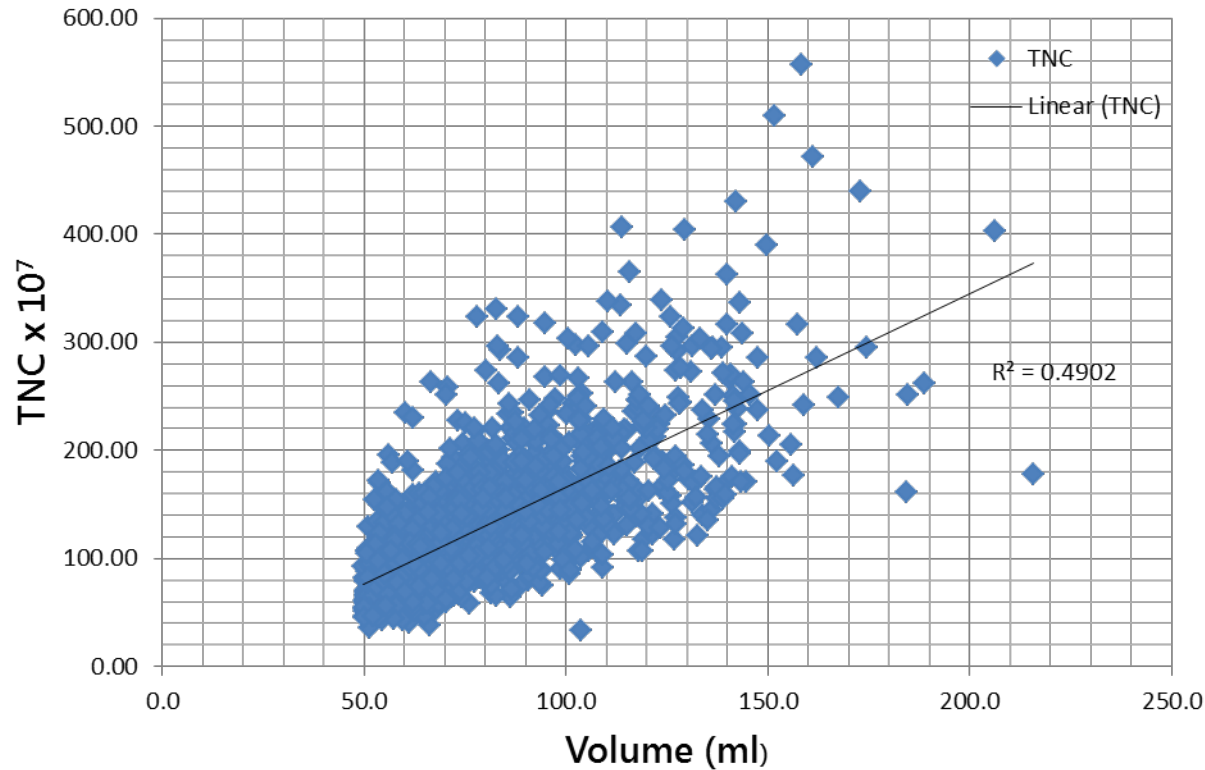
Low quality unit = Discarded due to the TNC count.

This retrospective study looks at data obtained over a 3 month period from cord blood collections at the NHS CBB.

- Volume of collected unit (ml)
- Ethnicity of donor
- Type of delivery
- CB Collector
- Collection Site
- Time delay from delivery to collection
- Midwife

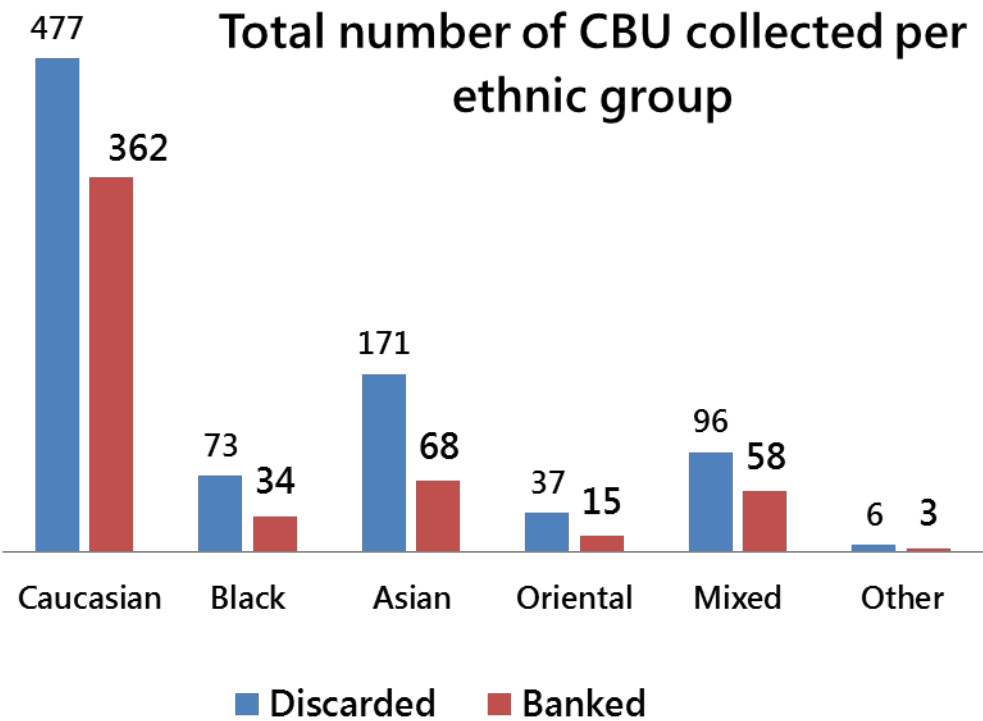


# Volume and TNC



	Volume	TNC
n	1418	1418
Mean	81.34	133.1
Standard Deviation	24.51	62.55
Range	166.24	523.15
Minimum	50	33.88
Maximum	215.89	557.03
R squared	0.49	

# Ethnicity of Donor Infant

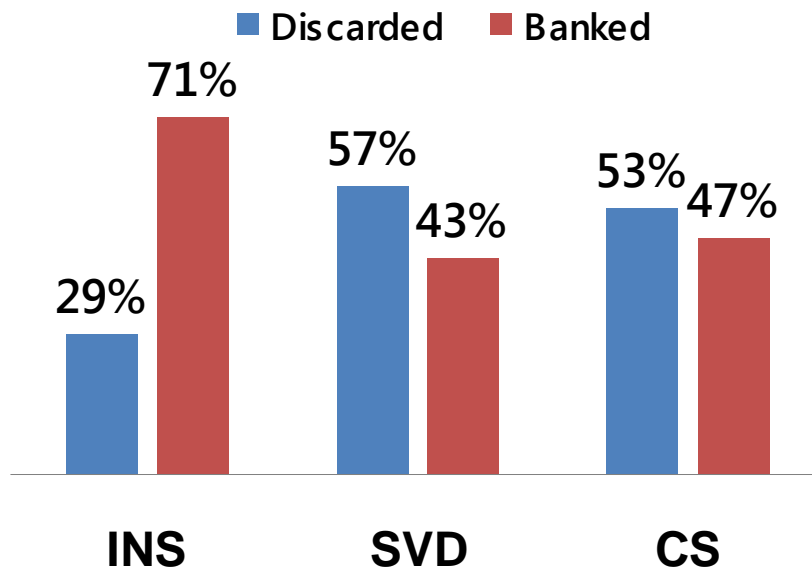


	Caucasian	BME Black and Minority Ethnic
Total number collected	839	561
Mean TNC	135.99	126.65
% Banked	43	32
P = 0.002		



# Type of delivery of donor infant

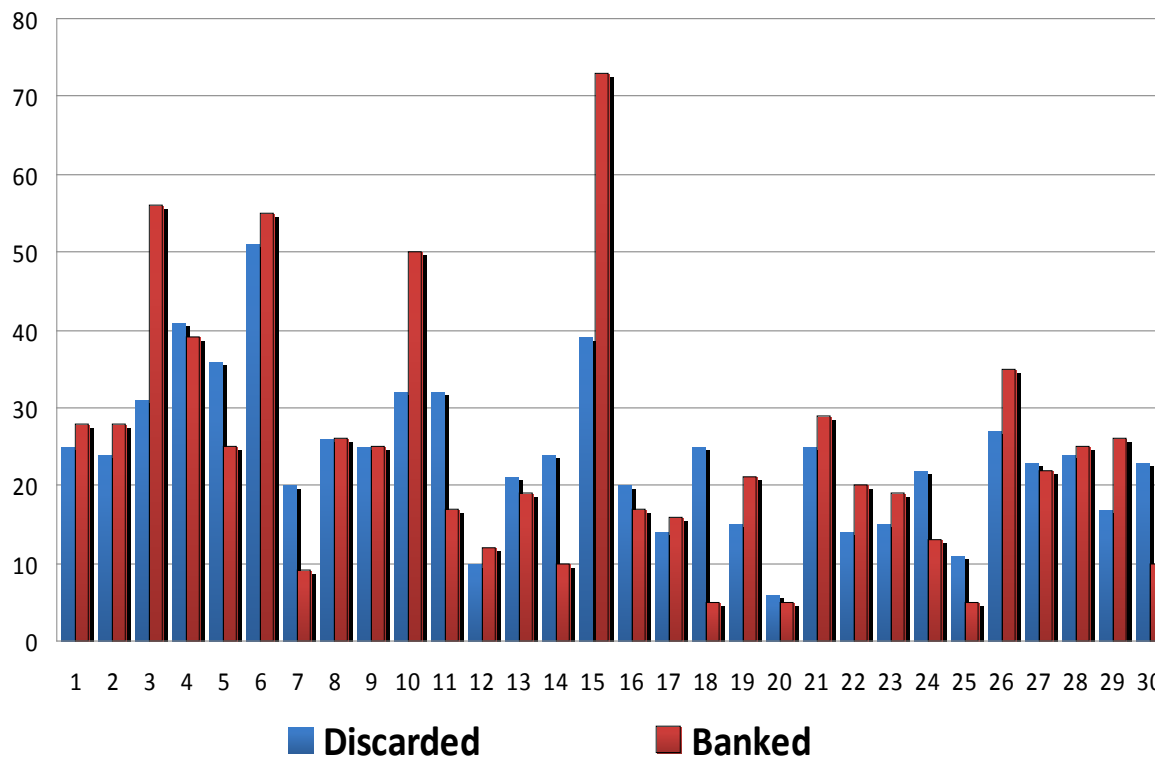
Percentage of banked/discarded CBU by type of delivery of donor infant



	Instrumental Deliveries	Non-instrumental Deliveries
n	226	1197
Mean	164.18	126.65
Median	153.35	110.08
Mode	127.97	185.98
Standard Deviation	73.64	57.97
Range	505.53	396.06
Minimum	51.5	33.88
Maximum	557.03	429.94
P value	2.2 x 10 <sup>12</sup>	

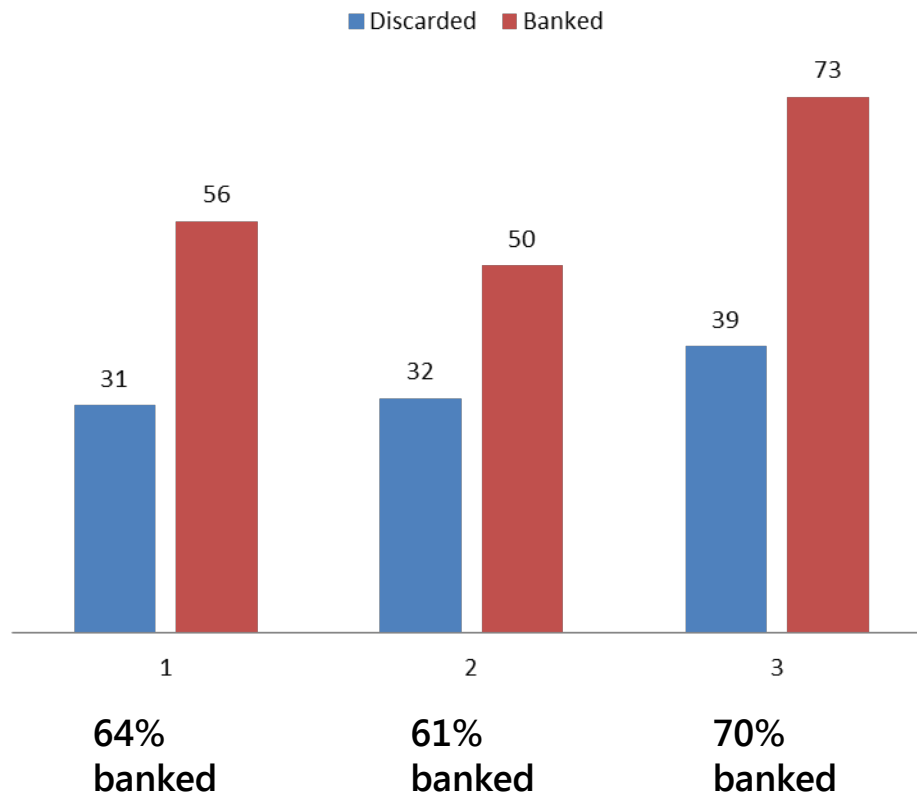
# Collection staff

**Individual Collectors Performance**



# Collection Staff

## Collectors Banking Rates



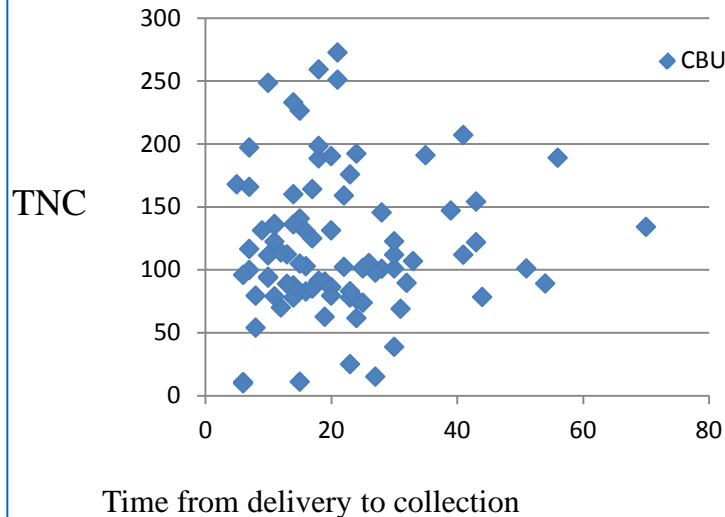
3 collectors – over 60% of collected units are banked:

- Different collection sites
- Different shift patterns
- Different levels of experience

# Non significant findings

**Time of delivery to collection**

**No significance found**



**Midwife**

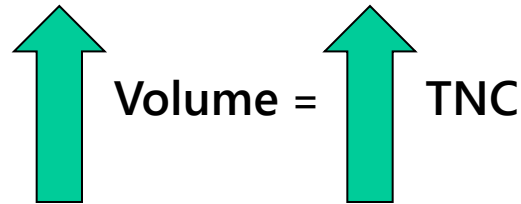
**No significance found**

- 256 different midwives
- 6 collection sites
- 24/7 shifts



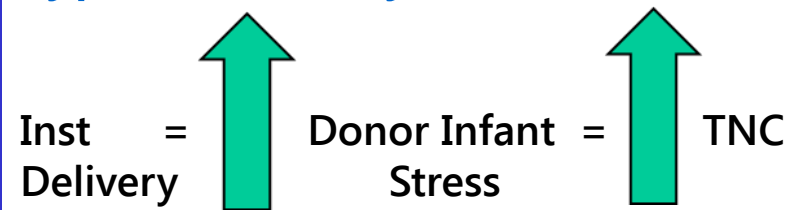
# Discussion – Summary of Findings

## Volume



Consistent with the findings of several previous studies

## Type of Delivery



No interference with delivery → target instrumental deliveries for CB collection.

## Ethnicity

Higher TNC in caucasian donors:

Birth weight ↑ long labour ↑ large volumes

Shortage of stem cell donors from the BME groups 40% of our bank from BME donors



## Collectors

Universal SOP's and training

Difference in collector

performance regardless of shift time or collection site

?Personality, dexterity, methodical, attitude of quality over quantity



# Discussion



## Further studies:

- Additional factors
- Qualitative study of collector variability
- Elective v emergency cesarean section TNC counts

Our findings do not provide us with a tool to determine the TNC count of a CBU at collection, but:

- Target collections during busy periods
- Allow us to efficiently bank more quality units.
- Provide high quality CBU for transplant
- Save more lives

## Acknowledgements:

All NHS CBB staff, in particular evaluation lab staff

All donor infants and their families





# References

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# Results

## Blood and Transplant

Variable		Details	n	Range	Mean	SD	Significance
TNC		Measure of stem cells in every CBU at collection	1418	33.8 – 557.03	133.1	62.55	
Collection site		6 collection sites, 5 24/7, 1 24/5					NS
Collectors		30 collectors, full time and part time					Requires discussion
Type of delivery		Measured as TNC count	1418				P=2.2x10 <sup>12</sup>
INS		Instrumental	226	51.5 - 557	164.2	73.64	
Non - INS		Non-Instrumental	1192	33.8 -429.9	126.65	57.97	
Volume Collected		Measured as (ml)	1418	50.0 - 215.89	81.34	24.51	R squared = 0.49
Time delay (mins)		From delivery of placenta to the start of collection		5 - 70			NS
Ethnicity		Measured as TNC count of donor infant	1400	33.88 – 557.03	132.0	62.56	
White		Including mixed white ethnicities	839	33.88 – 557.03	135.99	62.1	
BME (Black and minority ethnic)		Including Black, Asian, Oriental, Other and Mixed ethnicities	561	36.19 – 364.81	126.65	61.2	
Midwife		156 different midwives over the 3 month period at all sites					NS