

**ESTIMATION OF THE PRODUCT YIELD
AND COLLECTION EFFICIENCY OF
PERIPHERAL BLOOD STEM CELL HARVESTING
USING PERIPHERAL BLOOD CD34⁺ CELLS
QUANTIFICATION**

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ABSTRACT

Peripheral blood stem cells (PBSC) have been used for transplantation since the early 1990s. CD34⁺ has been used as a marker of hematopoietic stem cells to determine the optimal timing for PBSC harvesting. However, a wide ranges of CD34⁺ cells cut-off values from 8/ul to 66/ul have been used to initiate PBSC harvesting in autologous patients. We performed here a study to determine the peripheral blood CD34⁺ cells cut-off value for the prediction of stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/kg body weight patients, to study the correlation between peripheral blood CD34⁺ cells and stem cell yield, to study the correlation between the day 1 post-apheresis and day 2 pre-apheresis CD34⁺ count and to study the collection efficiency of the apheresis protocol used.

Forty eight patients with a total of 94 PBSC harvesting procedures were analyzed. All apheresis were performed using a COBE Spectra[™] Apheresis System. Pre and post apheresis peripheral blood CD34⁺ cells as well as the harvested CD34⁺ cell count were analysed using FACSCalibur flow cytometer. The CD34⁺ harvesting cut-off value was determined using the Receiver Operating Characteristic (ROC) curve analysis and the correlation study was done using Pearson's Correlation Analysis.

The cut-off value of ≥ 27 cells/ul has been shown to predict a stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/ kg body weight with a single apheresis with 95% sensitivity and 82.4% specificity. Pre-apheresis peripheral blood CD34⁺ cell count correlated well with the stem cell yields ($r = 0.963$ and $p < 0.001$). The day 1 post-apheresis peripheral blood CD34⁺ cell count correlates well with day 2 pre-apheresis count ($r = 0.895$), and a value of ≥ 25 cells/ul and may be able to predict the day 2 stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/ kg body weight. The median overall collection efficiency of the stem cell harvesting protocol was 63.7%.

In conclusion, this study has shown that PB CD34+ count of ≥ 27 cells/ul will predict the stem cell yields of $\geq 2 \times 10^6$ CD34+ cells/ kg body weight, and the apheresis protocol used for peripheral blood stem cell harvesting has gave satisfactory collection efficiency.

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LIST OF SYMBOL AND ABBREVIATION

%	Percentage
µl	Microlitre
7-AAD	7-Amino Actinomycin Dye
ACD-A	Acid Citrate Dextose Solution A
AML	Acute Myeloid Leukemia
BD	Becton Dickinson
CD	Cluster of Differentiation
CD 34	Surface Marker of Stem Cell
CE	Collection Efficiency
CLL	Chronic Lymphocytic Leukaemia
DLBCL	Difuse Large B-Cell Lymphoma
DNA	Deoxyribonucleic Acid
EDTA	Ethylene Diamine Tetra Acetic Acid
FITC	Fluorescein-5-Isothiocyanate
FSC	Forward Scatter
G-CSF	Granulocyte Colony Stimulating Factor
GM-CSF	Granulocyte Macrophage Colony Stimulating Factor
GVHD	Graft Versus Host Disease
HLA	Human Leukocyte Antigen
HSC	Hematopoietic Stem Cell
HSCT	Haematopoietic Stem Cell Transplantation
ICM	Inner Cell Mass
IL	Interleukin
ILMS	Integrated Laboratory Management System
ISHAGE	International Society Of Hematotherapy & Graft Engineering
kg	Kilogram

L	Litre
ml	Mililitre
MM	Multiple Myeloma
MNC	Mononuclear Cell
NaCl	Sodium Chloride
NHL	Non-Hodgkin's Lymphoma
NK- cell	Natural Killer Cells
PBSC	Peripheral Blood Stem Cell
PBSCT	Peripheral Blood Stem Cell Transplantation
PE	Phycoerythrin
PerCP	Peridinin-Chlorophyll Protein Complex
r value	Correlation Coefficient
SCF	Stem Cell Factor
SPSS	Statistical Package For Social Science
SSC	Side Scatter
TQproc	Total Quantity of Cells Processed
UCB	Umbilical Cord Blood
UKM	Universiti Kebangsaan Malaysia
WBC	White Blood Cell