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Presentation Goals

– Describe separation principles.

– Discuss technologies of HPC-A collections (past to present).

– Discuss optimization of HPC-A collection.

– Propose ideas for better collaboration between collection and processing staff.
Historical Perspective
Historical Perspective

Early Publications:


Historical Perspective

“Personal Perspective:”

– Late 1980s, MNC program developed for Fenwal CS3000 by Herb Cullis (Fenwal) and Charlie Carter (NIH); used for LAK cell study and PBSC collections
– 1990s, Cobe Spectra
  ▪ WBC-MNC program
  ▪ AutoPBSC program
– Most recognized technologies in the field: Fenwal CS-3000 and Cobe Spectra
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Separation Principles
Definition of Terms

– Intermittent flow process
  ▪ Example: Haemonetics, Cobe single access

– Continuous flow process
  ▪ Fenwal, Cobe Spectra double access, Fresinius

– Buffy coat

– Interface

– Dwell time
Incorporation of Computer Automation

– Minimizes operator involvement
– Standardizes collection
– Provides greater efficiency
– Allows operator more time to care for patient/donor
COBE 2991 Cell Washer
(Intermittent Flow Process)
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Separation Principles

- “Continuous” buffy coat collection
  - Example: Cobe Spectra, MNC program

- “Cyclic” buffy coat collection
  - Example: Cobe Spectra, AutoPBSC program
  - Fenwal, CS3000 and Amicus
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Collection Technologies
(Continuous Flow Processes)
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Fenwal CS3000 Collection Diagram

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The need is constant. The gratification is instant. Give blood.™
Cobe Spectra MNC Collection Program

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“Continuous” buffy coat collection

RBC and plasma out

Plasma out

WBC out

Blood in

- Whole blood
- WBC poor plasma
- WBC concentrate
- Packed red blood cells

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Cobe Spectra AutoPBSC Collection System

Dual Stage Filler

Disposable Channel

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“Cyclic” buffy coat collection

Accumulation phase

Harvest phase
Fenwal Amicus
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Fenwal Amicus Collection Diagram

American Red Cross
Optimization of Collection
Factors That Influence Separation

Instrument-Related:

– Centrifuge speed
– Flow rate
– Dwell time
Affects of Centrifugation at the Interface

- Mononuclear cells are quickly and efficiently expelled from the denser red cell layer due to the red cells zeta potential.
- Granulocytes are less dense and more pliable than mononuclear cells, thus resides between the mononuclear and red cell interface. Depending on the number of granulocytes, some may rise into the buffy coat layer, but most can be found embedded in the upper red cell layer.
Question #1

A patient is experiencing a low yield of CD34 cells in their product and the product possesses a higher than expected hematocrit. The following day, all collection parameters are the same from the day before, therefore the apheresis operator decides to “cut into the red cell interface deeper.” How would you anticipate this action affecting the following day’s product?
Answer to Question #1

Possible affects on product:
• Increase total WBC count
• Decrease MNC%
• Increase PMN%
• Increase Hct
• No significant change in CD34 yield
Question #2

A patient is on day #8 of “GCSF only” mobilization. On the current day of collection, the patient’s WBC count is 55,000/uL with a differential of 78% PMNs. The apheresis product comes to the lab with a very negligible hematocrit % compared to the day before. The current day’s CD34 yield was confirmed to be higher, despite a lower total WBC count. What would be the likely explanation for this result?
Answer to Question #2

The operator decreased the depth in which he/she collected into the red cell interface, anticipating that more granulocytes will populate the buffy coat layer.

The increase in CD34 yield was, likely, the result of increased mobilization (↑ # of circulating CD34 cells in peripheral blood).
Factors That Influence Collection

Physiological:

– Mobilization regimen
– Amount of prior chemo or radiotherapy
– Disease Type
Factors That Influence Separation and Collection

Other:

– Venous access
– Duration of collection
– Operator intervention
Effective Collaboration
Collaboration

– Constructively provide your knowledge of apheresis principles, associate the negative impacts an inefficient collection has on the quality of the product, from a processing perspective.

– Invite the collection staff to spend a day observing the processing and discuss additional processing that results in a less-than-ideal product.

– Arrange to spend a day observing the collection staff and learning their perspective.

– Be patient with the relationship-building process.
References


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