Welcome to eSessions

This session contains audio.
Review the information on each slide before continuing.
OPERATIONAL PRINCIPLES OF LRS® TURBO PLATELET COLLECTION

COBE® SPECTRA APHERESIS SYSTEM
Getting Around

Click on these **TABS** to change the view of the left sidebar:

- **OUTLINE** shows links to each slide.
- **THUMBNAILS** shows a small image of each slide.
- **SEARCH** allows you to search the eSession by keyword(s).

- This button toggles between **PLAY** and **PAUSE**. Click the **PLAY** button to continue.
- Go to **PREVIOUS** screen.
- Go to **NEXT** screen.
- Click this icon to toggle between **FULL SCREEN** and **STANDARD** view.
Presentation Objectives

Participants will be able to

- Discuss the COBE Spectra Apheresis System separation and leukoreduction process.
- State the difference between Inlet:AC ratio and AC infusion rate using the COBE Spectra system.
- Describe the importance of accurate donor total blood volume (TBV) and the effect on donor comfort.
- Define and differentiate between yield and concentration.
- Discuss how the COBE Spectra system monitors and controls platelet product quality.
Separation of Components
Dual-Stage Channel Separation With LRS Turbo (LRST)
LRST Filler
Leukoreduction

Fluidized Particle Bed Separation

- Platelets act as a physiological filter.
- Particle bed separates WBCs from platelets during collection.
- Platelets must be collected from the LRS chamber to achieve yield.
LRS Leukoreduction

Leukoreduction occurs here

RBCs and most WBCs separate here
G-force exerted by the centrifuge separates the cells.

Chamber geometry and plasma counter-flowlow rate enhance separation.
Anticoagulation

ACD-A
(Anticoagulant citrate dextrose-formula A)
Action:
- Binds Ca++ in the extracorporeal circuit.
- Lowers whole blood pH.
- Inhibits platelet clumping.
- Sets up storage conditions.
Clotting Cascade

- Ca++
- XII
- XIIa
- XI
- Xa
- IX XIa
- IXa X
- Thrombin
- Fibrinogen
- Fibrin
- Prothrombin
- V, Ca++ ,PI
- VII, Ca++ ,PI
- IXa
- Citrate binds free ionized calcium to prevent blood from clotting
Anticoagulation Management

- AC flow rate: Rate anticoagulant is added to the extracorporeal circuit by AC pump.
- AC infusion rate: Rate anticoagulant is delivered to the donor or patient.
- Inlet:AC ratio: Concentration of anticoagulant in the extracorporeal circuit.
Total Blood Volume

- Sex
- Height
- Weight

TBV relates to individual’s ability to tolerate citrate.
AC Infusion Rate

Amount of AC infused (mL) per minute for every liter of the donor’s TBV

- 5L TBV: 0.8mL/min
  - 4.0 mL/min infused

- 3L TBV: 0.8mL/min
  - 2.4 mL/min infused
Controlling AC Infusion

- Press MENU, 1 for Data entry, 4 for AC data:
  \[ AC \text{ infusion} = 0.8 \]

- Press MENU, 1 for Data entry, 4 for AC data:
  \[ AC \text{ infusion} = 1.0 \]

If you increase the inlet pump flow rate, the actual AC infusion rate may be higher than the configured rate.
Citrate Reactions

1. Pause the procedure.
2. Decrease the inlet pump flow rate.
Inlet:AC Ratio

The ratio of whole blood to anticoagulant in the extracorporeal circuit.

Actions:
- Prevents blood from clotting
- Establishes the initial pH environment in the platelet bag
- Prevents platelet clumping
Inlet: AC Ratio

Ratio=8

Ratio=10

Ratio=12

● = AC
○ = Whole blood

The higher the ratio, the less anticoagulated the circuit is.
### Inlet:AC Ratio

AC pump flow rate × Inlet:AC ratio = Inlet pump flow rate

<table>
<thead>
<tr>
<th>5.0</th>
<th>40.0</th>
<th>XX</th>
<th>XX</th>
<th>8.0</th>
<th>2400</th>
</tr>
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Increasing the ratio from 8.0 to 10.0 further dilutes the AC, resulting in a less anticoagulated circuit.
## Effect of Changes to the Inlet Pump and Inlet:AC Ratio

<table>
<thead>
<tr>
<th>AC Pump</th>
<th>Inlet Pump</th>
<th>Inlet:AC Ratio</th>
<th>AC Infusion</th>
<th>Comments</th>
</tr>
</thead>
</table>
| ↑       | ↑          | ¬              | ↑           | 1. Potential for AC reaction.  
2. Increase yield or decreases time. |
| ¬       | ↑          | ↑              | ¬           | 1. Potential for clumping.  
2. Increases yield or decreases time. |
| ↓       | ↓          | ¬              | ↓           | 1. Due to citrate reactions.  
2. Poor access. |
| ¬       | ↓          | ↓              | ¬           | 1. Due to clumping or clotting. |

= changed value
Custom Ratio Ramping

Custom ratio ramping allows you to decrease the anticoagulation of the circuit at set times during the run, enabling you to:

- Optimize the procedure
- Increase procedure automation

The ratio ramp can be customized in the configuration menu.
Data Entry

Operator enters:

- Sex
- Height
- Weight
- Hematocrit
- Platelet count

The COBE Spectra system automatically sets pump flow rates.
Hematocrit (Hct)

Methods:
- Best: Venous sample day of collection
  - 4% to 7% variability
- Second best: Spun Hct from a finger stick
- Not recommended: Historical count or ear stick
Effects of Inaccurate Hematocrit

Inaccurate Hct directly affects the position of the interface, resulting in:

- RBC spillover: Hct entered is too low
- WBC contamination: Hct entered is too low
- Low platelet yield: Hct entered is too high
Pre-Procedure Platelet Count

Methods:

- **Best:** Venous sample day of collection
  - 5% variability
- **Second best:** Average of last 2 to 4 counts
  - 8% to 15% variability
- **Not recommended:** Default count
  - 30% variability
Effects of Inaccurate Platelet Count

Inaccurate platelet count directly affects Procedure outcomes, resulting in:

- High concentration: Platelet count entered is too low
- Yield higher than predicted: Platelet count entered is too low
- Low concentration: Platelet count entered is too high
- Low yield: Platelet count entered is too high
Components of Predicted Platelet Yield Calculation

- Donor platelet count
- Inlet flow
- Time

Predicted platelet yield
Predicted Platelet Concentration

Platelet concentration equals the number of platelets in a microliter
- Default = 1,400,000/microliter
- Range for 5-day storage = 1,000,000 to 2,100,000/microliter
Predicted Collect Volume

\[
\frac{\text{Yield}}{\text{Concentration}} = \text{Predicted collect volume}
\]

Example:

\[
\frac{4.2 \times 10^{11} \text{ platelets}}{1,400,000 \text{ platelets/microliter}} = 300 \text{ mL collect volume}
\]
PIR (Platelet Inventory Recovery)

PIR recovers platelets from the saturated platelet bed in the LRS chamber and directs them to the collect storage bag.

The recovered platelets have already been included in the platelet yield calculation.
The collect concentration monitor (CCM) monitors platelet product quality by:

- Detecting spillovers during Run mode and PIR
- Estimating current yield in the collection bag
- Monitoring potentially WBC-contaminating events
- Predicting end run yield at the end of the procedure after PIR

Note: The predicted yield is accurate and should be used to optimize the procedure. The CCM value is not accurate and should not be used for yield determination. An accurate platelet count is required for an accurate predict run yield.
Content Messages

When no potential WBC-contaminating events are observed, the following message appears on the screen:

Label LRS product as <1E6 WBC content. Press CLEAR.
WBC Content Messages (cont)

When events occur during the procedure that may result in platelet yield reduction and/or WBC contamination, the message below appears on the screen:

Measure platelet and WBC content!
XXXXXXXXXXXXXX                 Press CLEAR.

The code on the bottom left-hand corner will explain the reason for this message.
Measure Message Codes and Reasons

- Collect flow
- Concentration
- CCM
- Manual mode
- Power fail
- Centrifuge
- PIR
- Spillover