Welcome to eSessions

This session contains audio. Review the information on each slide before continuing.
BONE MARROW PROCESSING (BMP) PROCEDURES

COBE® SPECTRA APHERESIS SYSTEM

Click here to begin
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 Overview

- Loading and priming the BMP and WB disposable tubing sets
- Entering the bone marrow data
- Transferring the bone marrow to the BMP set
- Connecting the BMP set to the WBC set and starting the run
- Collecting the mononuclear cells: Operational principles of MNC procedures
- Using Quick Start, and establishing and controlling the interface
- Collecting the mononuclear cells
- Helpful hints and performing Rinseback
Presentation Objectives

Participants will be able to:

- State the purpose of bone marrow processing.
- Identify the disposable tubing sets required for bone marrow processing.
- State three factors that must be considered prior to starting a bone marrow processing procedure.
- State the default values and procedure run parameters for bone marrow processing procedures and one factor that determines them.
Presentation Objectives (cont)

- State the minimum RBC volume required to perform a BMP procedure.
- State the significance of the COBE Spectra system screen message “Press 1 when Bag A empties, Press 2 to disable beeps.”
- State how to determine when to process more than the default inlet volume.
Bone Marrow Harvesting

In the operating room, under sterile conditions and general anesthesia, marrow is collected by multiple aspirations.

- The site of choice is the posterior iliac crest of the pelvis.
- The marrow is collected in heparin and should be filtered to eliminate bone chips.
- The total volume of bone marrow obtained is usually 800 to 1,500 mL (10 to 20 mL/Kg).
- The volume collected is not as important as the number of nucleated cells.
BMP Procedure Supplies

- Single-stage filler
- WBC disposable tubing set (catalog # 777006300, 70600)
- BMP set (catalog # 777006300, 70630)
- COBE Spectra system WBC Colorgram (catalog # 700744000)
- 0.9% sodium chloride
- Hemostats
- 600 mL transfer bag with male luer
BMP Processing Set

![Diagram of BMP Processing Set]

- **Administraiton Lines**
- **Luer Lines**
- **Access and Return Connections**
- **Drip Chambers**
- **Bone Marrow Spikes**

BMP Processing Set shows the connection points for administration and return lines, luer lines, access and return connections, drip chambers, and bone marrow spikes.
Loading and Priming the Disposable Tubing Sets
Loading the WBC Disposable Tubing Set

Refer to COBE® Spectra Apheresis System Operator’s Manual for information on loading and removing the WBC disposable tubing set.
Priming the Set

1. Select set type WBC

Select WBC procedure
1=MNC 2=PMN 3=BMP 4=AutoPBSC

2. Select procedure type BMP

Clamp access, return and AC lines
Close both saline lines. Press CONTINUE
Remember:

- You do not need ACD-A to perform a BMP procedure.
- Place a hemostat on the AC line.
Placing the Hemostat on the AC Line

Place the hemostat on the AC (clear) line as close to the manifold as possible.
3. Follow the screen prompts to prime the tubing set:

Connect the WBC tubing set to fluid containers. Press CONTINUE
Priming the Set (cont)

1. Prime access, return connections (and Spectratherm line) CONTINUE

2. Clamp access saline line Clamp access line CONTINUE

3. Testing access pressure sensor Prime BMP
4. Open saline line  
   Press CONTINUE

5. Perform alarm tests (Yes/No)  
   Press CONTINUE
Entering Bone Marrow Data
Caution

- 100 mL is the minimum volume of RBC that you may enter.
- Clinical data have indicated that processing marrow with less than 125 mL of RBC volume will be less efficient.
- A patient-compatible unit can be added to the marrow to raise RBC volume to the minimum amount.
Entering the Bone Marrow Data

Total bag volume = \{nnnnn\} ml
Bone marrow hematocrit = \{nn\}%
## BMP Procedure Default Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of run</td>
<td>3 – 5 x Total bag volume (TBV)</td>
</tr>
<tr>
<td>Inlet:AC ratio</td>
<td>1:99.9 (AC pump is not used during a BMP procedure)</td>
</tr>
<tr>
<td>AC pump flow rate</td>
<td>0 mL/min</td>
</tr>
<tr>
<td>Inlet flow rate</td>
<td>70 mL/min if TBV &lt; 1 L</td>
</tr>
<tr>
<td></td>
<td>90 mL/min if TBV &gt; 1 L</td>
</tr>
<tr>
<td>Collect pump flow rate</td>
<td>1.5 mL/min</td>
</tr>
</tbody>
</table>
Inlet volume processed will vary according to the RBC volume of the marrow:

- > 215 mL RBC volume
  - 3 x marrow volume*
- Between 170 and 215 mL RBC volume
  - 4 x marrow volume*
- Between 100 and 170 mL RBC volume
  - 5 x marrow volume*

* The system recalculates the target inlet volume processed after the collect valve opens.
Initial Run Results Screen

Inlet Volume = 1500 ml, Inlet Flow = 90.0
Time = 17 min., Collect = 50. OK?(YES/NO)

- The screen initially shows the inlet volume and time allowed to establish the interface and open the collect valve.
- The system will automatically update the inlet target and procedure time once the collect valve is opened.
Entering the Bone Marrow Data (cont)

- This screen appears if the bone marrow has an RBC volume > 215 mL.
- The system automatically collects plasma. You **MUST** connect a plasma bag at the plasma line luer connection of the WBC set.
Entering the Bone Marrow Data (cont)

Bone Marrow Procedure
1 = Edit Data  2 = Review Run Results

Once initial data is entered, you may edit the entered data or review the run results.
Transferring the Bone Marrow to the BMP Set
STOP!
BEFORE PROCESSING: The bone marrow must be filtered prior to processing to remove bone chips, debris and clots. Filter the bone marrow using a 170 micron filter.
Adding ACD-A Before Processing

Add ACD-A to the marrow at an ACD-A/marrow volume ratio of 1:10 as follows:

- Add the weights of the bags of bone marrow and calculate the volume:
  - Volume (mL) = marrow weight – bag tare weight(s)/1.058
- Calculate the volume of ACD-A to add:
  - Volume (mL)/10 = ACD-A volume
- Measure the hematocrit of the marrow after adding ACD-A.
Transferring the Bone Marrow

When the following screen appears the WBC set is primed and ready for use:

- Connect Bone Marrow
- Close saline lines

Transfer the filtered bone marrow to the BMP set if not already done.
To transfer the bone Marrow

1. Place a hemostat at point 0 as marked on the BMP set.
Transferring the Bone Marrow (cont)

2. Clamp all the white pinch clamps on the administration lines of the BMP set.

3. If the bone marrow was pre-filtered, connect the marrow bag with the spikes on the administration lines.
Transferring the Bone Marrow (cont)

4. To filter during transfer of the marrow to bag A:
   ▪ Connect a 170-micron filter to marrow bag.
   ▪ Connect the filter administration set to the luer connection on the BMP bag.

5. Open the clamp to the line attached to the BMP set.

6. Transfer the bone marrow to bag A.
7. Once the marrow has been transferred, permanently seal the administration line of the BMP set.
Connecting the Bone Marrow Processing Set to the WBC Set and Starting the Run
Connecting the BMP Set to the WBC Set

1. Connect the **red** line on the BMP set to the **access line** on the WBC set.
2. Connect the **blue** line on the BMP set to the **return line** on the WBC set.
3. Hang the processing bags and remove the hemostat from point 0.
4. Allow bone marrow to prime the access and return lines on the BMP set, and then place the hemostat at point 1.
5. Close the roller clamps on the access and return saline lines on the WBC set.
6. Open the white pinch clamps on the access and return lines.
Connecting the BMP Set to the WBC Set (cont)
Starting the Run

- Press CONTINUE to start the run.
  The following screen appears:

  X.X  X.X  X.X  X.X  X.X  XXXX
  Diverting prime saline
Collecting the Mononuclear Cells: Operational Principles of MNC Collection Procedures
White Blood Cell (WBC) Fluid Pathway
WBC Single-Stage Channel Separation
Centrifugal Separation

Centrifugal force separates cells based on their specific gravity.

*Average specific gravity of cell type shown

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelets</td>
<td>1.048*</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>1.071*</td>
</tr>
<tr>
<td>Monocytes</td>
<td>1.065*</td>
</tr>
<tr>
<td>Granulocytes</td>
<td>1.085*</td>
</tr>
</tbody>
</table>
Centrifugal Separation (cont)

Density Ranges of Blood Cells

This represents a rough description of blood cell density ranges derived from many papers in the literature.
Centrifugal Separation (cont)
Effects of G-Force on Separation
Separation factor is a function of channel dwell time and centrifugal force.

*Separation factor for MNC procedures is 500.
Using Quick Start, and Establishing and Controlling the Interface
Quick Start

- Quick Start is an automated method to establish the plasma/RBC interface.
- During Quick Start the plasma pump flow rate automatically changes to position the interface.
- Enter an accurate pre-procedure hematocrit for best performance.
Quick Start (cont)

- The system processes 200 mL of RBCs during Quick Start to complete the phase.
- Selecting Manual mode or changing the plasma pump flow rate will end Quick Start before it is complete.
- Do not change the plasma pump flow rate during Quick Start unless the collect line is too dark.
Quick Start (cont)

The following screen appears when Quick Start is complete:

Quick Start completed: Monitor collect line. Press CLEAR
Establishing the Interface

Once Quick Start is complete and the interface is established, monitor the interface to refine or maintain the position.
Controlling the Interface

- Monitor the collect line using the Colorgram™ to establish a collect line color representing the desired hematocrit of the product.
- Consider the color of any media used.
Controlling the Interface (cont)

Make incremental changes to the plasma pump flow rate:

- If the color is too light, increase the plasma pump flow rate.
- If the color is too dark, decrease the plasma pump flow rate.
- Make larger changes (~2 to 3 mL/min) if the interface is either too low or too high.
- Make smaller changes (~ 0.5 mL/min) if the interface is almost on target.
- Allow 1 to 3 minutes between changes.
Controlling the Interface (cont)

**Too Dark**
Collecting too deep in RBC layer
Decrease plasma pump flow rate

**Too Light**
Not collecting deep enough in RBC layer
Increase plasma pump flow rate
Collecting the Mononuclear Cells
Opening the Collect Valve

When the interface is in the correct position and the collect line is the desired color:

1. Press **VALVE**.
2. Press 4 to select the collect valve.
3. Press 1 to select collect.
4. Press **ENTER**.
Processing the Bone Marrow

- The system first draws the bone marrow from bag a and then returns it to bag b.
- When you move the hemostat from position 1 to position 2, the bone marrow is drawn from bag B to bag A.
- This transfer between bags continues until the target volume has been processed.
- IMPORTANT: Lightly agitate the bone marrow to mix it throughout the procedure!
Setting the Bag Timing Prompt

BMP Bag Timing: Press 1 when Bag A empties
Press 2 to disable beep
Setting the Bag Timing Prompt (cont)

To calibrate warning beeps:

- BMP Bag Timing: Press 1 when Bag A empties
  Press 2 to disable beep

- Press 1 when you move the hemostat to point 2.
- To disable the warning beeps for the entire bone marrow procedure, press 2.
Setting the Bag Timing Prompt (cont)
Setting the Bag Timing Prompt (cont)

- Press **CLEAR** to remove the “BMP Bag Timing” screen message.

  BMP Bag Timing: Press 1 when Bag A empties
  Press 2 to disable beep
Setting the Bag Timing Prompt (cont)
Helpful Hints and Performing Rinseback
Sampling Helpful Hints

- Obtain a sample during processing. Consider processing longer if recoveries are low.
- An unstable interface can result in low recoveries, and can be due to over-heparinization.
- Processing additional bag volumes may result in increased granulocyte contamination with little increase in MNC yield.
- Consider what cell type is being counted when doing recovery calculations: TNC versus MNC.
- The pre- and post-processing product sample is most accurate when taken from a pooled product.
Performing Rinseback

1. When marrow processing is complete, the following screen appears:

   Clamp access. Open access saline.
   END OF RUN. Press CONTINUE to Rinseback

2. Press Change Mode. The following screen appears:

   Clamp access. Open access saline.
   END OF RUN. Press CONTINUE to Rinseback

Performing Rinseback

1. Clamp access. Open access saline. Press CONTINUE to Rinseback

2. Rinseback: Collecting

3. Clamp and disconnect collection bags Press CLEAR
More Helpful Hints

Refer to Chapter 10, “Helpful Hints” in the COBE Spectra system operator’s manual for the following procedures:

- “How to Recover and Concentrate RBCs After Bone Marrow Processing”
- “How to Establish the WBC Interface Position”