Welcome to eSessions

This session contains audio. Review the information on each slide before continuing.

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OPERATIONAL PRINCIPLES OF THERAPEUTIC PLASMA EXCHANGE (TPE) 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.
TPE Disposable Tubing Set

Fluid pathway
TPE Channel Blood Component Separation

- Whole Blood In
- RBC, WBC, and Platelet Return
- Plasma Out
- Platelet Return
Presentation Overview

- Data entry
- TPE run results
- Pump flow rate calculations
- Fluid balance
- AC distribution
It All Starts With Data Entry…

Every piece of patient information you enter is used by the COBE Spectra system to calculate the run parameters needed to perform a successful TPE procedure.
Data Entry

- Sex
- Height
- Weight
- Hematocrit (Hct)
- Replacement fluid type
- Fluid balance
TPE Run Results

Replace = 2500ml, Removed = 3000ml, (1.0)
AC = 500ml, Time = 100 min. OK (YES/NO)?

The COBE Spectra system will
- Replace a volume of 2,500 mL
- Remove a volume of 3,000 mL
- Exchange 1.0 plasma volume
- Use 500 mL of ACD-A solution
- Complete the run in 100 minutes
Calculating Plasma Volume

Total blood volume (TBV) x (1-Hct) = Plasma volume
6,000 x 0.60 = 3,600 mL
Plasma Volumes Exchanged

Plasma Volumes Exchanged =
% of Disease Mediator Removed =
Therapeutic Effectiveness of TPE
TPE Run Results

- Removed:
  - Patient’s plasma, including part of the AC from the ACD-A bag that is pumped by the plasma pump to the waste bag

- Replace:
  - Replacement fluid pumped by the replacement pump to the patient

- AC:
  - AC from the ACD-A bag pumped by the AC pump and added to the whole blood drawn from the patient

- Time:
  - Inlet volume processed divided by the inlet pump speed
Pump Flow Rate Calculations

- AC pump flow rate
- Inlet pump flow rate
- Plasma pump flow rate
- Replacement pump flow rate
TBV Data Entry

- Sex
- Height
- Weight

Total blood volume = {1410} ml
(41 in, 55 lbs, Female) OK? (Yes/No)

The COBE Spectra system allows the operator to directly enter a total blood volume to accommodate pediatric and special patients.

The COBE Spectra system uses the Nadler and Allen nomogram.
Why is TBV Important?

- TBV relates to the individual’s ability to tolerate citrate.
- The COBE Spectra system uses TBV to calculate the AC infusion rate to the patient.
AC Infusion Rate

Amount of AC infused to the patient per minute for every liter of the patient’s TBV (mL/min/L TBV)

Think of the AC infusion rate as a dosage.
Default AC Infusion Rate

- The default AC infusion rate for a TPE procedure is 0.8 mL/min/liter TBV.
- To view the current AC infusion rate during a TPE procedure, select MENU, 1 for Data entry, 4 for AC Data.

AC infusion rate: 0.8 ml/min/liter TBV.
ml AC in bags: collect ____ , plasma: ____
AC Infusion Rate (cont)

TBV x default AC infusion rate (dosage) = AC infusion rate (dose) to the patient

Default AC infusion rate for TPE = 0.8 mL/min/L TBV.

- 0.8 mL/min/5 L TBV
  - 4.0 mL/min of AC are infused (AC dose)

- 0.8 mL/min/3 L TBV
  - 2.4 mL/min of AC are infused (AC dose)
Amount of Citrate in Replacement Fluid

![Graph showing the amount of citrate in plasma, albumin, and saline. Plasma has the highest amount, followed by albumin, and saline has the least.](image-url)
AC Infusion Rate (cont)

1. AC added to the extracorporeal circuit from
   - ACD-A bag
   - Replacement fluid
2. Minus AC going to the plasma waste bag
3. Equals AC delivered to the patient
AC Pump Flow Rate

AC infusion rate to the patient and AC to plasma the bag

Determine AC pump flow rate
Inlet:AC Ratio

The concentration of anticoagulant provided in the extracorporeal circuit.
If you ↑ the Inlet:AC ratio, there is a ↓ in the concentration of AC in the circuit, which ↓ the anticoagulation effect.
Inlet:AC Ratio Configuration

To configure the Inlet:AC ratio, press MENU, 6 for Configuration, ENTER for more, 3 for ratio.

Select Inlet:AC ratio configuration:
1=Platelet, 2=TPE, 3=MNC, 4=PMN, 5=AutoPBSC

Enter TPE Inlet:AC ratio default value {10.0}
## Inlet Pump Flow Rate

AC pump \( \times \) Inlet:AC = Inlet pump flow rate \( \times \) ratio = Inlet pump flow rate

<table>
<thead>
<tr>
<th>AC</th>
<th>INLET</th>
<th>PLASMA</th>
<th>COLLECT</th>
<th>REPLACE</th>
<th>INLET:AC RATIO</th>
<th>RPM</th>
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</thead>
<tbody>
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<td>7.0</td>
<td>70.0</td>
<td>XX.X</td>
<td>XXXX</td>
<td>10.0</td>
<td>XXXX</td>
<td>TPE</td>
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</table>
Plasma Pump Flow Rate

Plasma is removed from the TPE channel at a rate which will maintain a 70% Hct in the RBC line exiting the centrifuge.

<table>
<thead>
<tr>
<th>AC</th>
<th>INLET</th>
<th>PLASMA</th>
<th>COLLECT REPLACE</th>
<th>INLET: AC RATIO</th>
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<td>XX.X</td>
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<td>----</td>
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<td>---._</td>
<td>____</td>
<td>____</td>
<td>TPE</td>
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</table>
Plasma pump flow rate is determined by:

- RBC line Hct
- TBV and Hct:
  - The amount of plasma volume in the whole blood processed
- Inlet pump flow rate:
  - The amount of anticoagulated whole blood processed per minute
Plasma Pump Flow Rate (cont)

- Flow rate controls the RBC/plasma interface position.
- Patient Hct entry influences the flow rate.
Replacement Pump Flow Rate

The replacement pump flow rate is determined by:

- Fluid balance
- Plasma pump flow rate
- AC pump flow rate
Replacement Pump Flow Rate (cont)

@100% fluid balance: Replace pump = Plasma pump – AC pump

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<tr>
<th></th>
<th>5.0</th>
<th>50.0</th>
<th>30.0</th>
<th>25.0</th>
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@110% fluid balance: Replace pump > Plasma pump – AC pump

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<th>28.0</th>
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<th>TPE</th>
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@90% fluid balance: Replace pump < Plasma pump – AC pump

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<th>10.0</th>
<th>XXXX</th>
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</table>
Fluid Balance

Fluid removed
Volume removed from patient

VS

Fluid replaced
Volume given to patient

or

“Ins”

VS

“ Outs”

Operational Principles of TPE Procedures
Fluid Balance (cont)

Replace=2500 ml, Removed=3000 ml, (1.0)
AC=500 ml, Time=100 min. OK (YES/NO)?

\[
\text{AC volume} + \text{replace volume} \times 100 = \text{fluid balance}
\]

\[
\frac{500 \text{ mL} + 2,500 \text{ mL}}{3,000 \text{ mL}} \times 100 = 100\% \text{ fluid balance}
\]
Fluid Balance (cont)

- If you change the fluid balance during the run, the COBE Spectra system will recalculate the fluid balance for the remainder of the run only.
- Fluid balance is instantaneous, not accumulative.
Rinseback

Start (0)

-150 mL

Divert

Run

(345 mL)

Rinseback

End (+195 mL)
Isovolemia

\[(AC \text{ volume } + \text{ replace volume}) - 195 \text{ mL } \times 100 = \text{ new fluid balance}\]

\[\text{removed volume}\]

\[\frac{(500 + 2,500) - 195 \times 100}{3,000} = 93.5\%\]
Hypervolemia

Physician’s order: “Give an additional 500 mL.”

1. Enter 100% fluid balance.

Replace = 2500 ml, Removed = 3000 ml, (1.0),
AC = 500 ml, Time = 100 min. OK (YES/NO)?

2. Recalculate the fluid balance.

$$\frac{500 \text{ mL} + 2500 \text{ mL} + (500 \text{ mL} - 195 \text{ mL}) \times 100}{3000 \text{ mL}} = 110\%$$

3,000 mL
3. Press **NO** in the “End Results” screen and choose key number **9**.

   Replace=2500 ml, Removed=3000 ml, (1.0), AC=500 ml, Time=100 min. OK (YES/NO)?

   Change: 1=replace volume, 2=removed volume, 3=run time, 4=inlet flow.

4. Enter the new fluid balance.

   Fluid Balance {110}% (Y/N)
Hypovolemia

Physician’s order: “Remove additional 300 mL.”

1. Enter 100% fluid balance.

   Replace=2500 mL, Removed=3000 mL, ( 1.0 ),
   AC=500 mL, Time=100 min.       OK (YES/NO)?

2. Recalculate the fluid balance.

   \[
   \frac{500 \text{ mL} + 2,500 \text{ mL}}{3,000 \text{ mL}} - \left( \frac{300 \text{ mL} + 195 \text{ mL}}{3,000 \text{ mL}} \right) \times 100 = 84\%
   \]

   3,000 mL
Hypovolemia (cont)

3. Press **NO** in the “End Results” screen and choose key number **9**.

   Replace=2500 ml, Removed=3000 ml, (1.0), AC=500 ml, Time=100 min. OK (YES/NO)?

   Change: 1=replace volume, 2=removed volume, 3=run time, 4=inlet flow.

4. Enter the new fluid balance.

   Fluid Balance {84}% (Y/N)
Fluid Balance End of Procedure Calculations

Replace = 2500 ml, Removed = 3000 ml, (1.0), AC = 500 ml, Time = 100 min. OK (YES/NO)?

“Ins”
- AC: 500
- Replaced: 2,500
- Rinseback: 195

+ 3,195

“ Outs”
- Removed: 3,000

-3,000

-195
Anticoagulant Distribution

Replace = 2500 ml, Removed = 3000 ml, (1.0), AC = 500 ml, Time = 100 min. OK (YES/NO)?

AC infusion rate: 0.8 ml/min/liter TBV.

mLs AC om bags: collect: 0, plasma: 400

- Removed − AC in plasma = “True” plasma removed
  (3,000 mL)    (400 mL)    (2,600 mL)

- AC used − AC in plasma = AC to patient
  (500 mL)    (400 mL)    (100 mL)

- AC to patient + replace = “True” replace given
  (100 mL)    (2,500 mL)    (2,600 mL)
Replace = 2500 ml, Removed = 3000 ml, (1.0), AC = 500 ml, Time = 100 min. OK (YES/NO)?

AC infusion rate: 0.8 ml/min/liter TBV.

mLs AC in bags: collect: 0, plasma: 400

"Ins"
AC to pt: 100
Replaced: 2,500
Rinseback: 195

+ 2,795

"Outs"
Removed: 3,000
AC in plasma: -400

= 2,795

-2,600
+195

True pls removed: 2,600
Visit the Support Center on our website to access

- User materials
- Promotional materials
- Tools, including
  - Fluid balance calculation tool for TPE procedures
- Educational events
- Certificates and customer letters
## Examples of Pre-Run Fluid Balance Calculations for COBE® SPECTRA™ TPE Procedures

### Hypovolemia, Prime Saline Diverted

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter TPE Removed Volume Based on a Fluid Balance of 100% (ml)</td>
<td>3000</td>
</tr>
<tr>
<td>2</td>
<td>Enter Specified Net Volume Change in Patient (ml) (Enter a Negative Number for Hypovolemia, or a Zero for Isovolemia)</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>If Prime Saline is Not Diverted to the Waste Bag, Enter N</td>
<td></td>
</tr>
</tbody>
</table>

| Conclusion | New Fluid Balance (%) (Enter This Value into the Spectra System) | 84     |

Click Here To Return To FB Calculations

### Isovolemia, Prime Saline Diverted

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<td>2</td>
<td>Enter Specified Net Volume Change in Patient (ml) (Enter a Negative Number for Hypovolemia, or a Zero for Isovolemia)</td>
<td>0</td>
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<td>3</td>
<td>If Prime Saline is Not Diverted to the Waste Bag, Enter N</td>
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| Conclusion | New Fluid Balance (%) (Enter This Value into the Spectra System) | 84     |

### Hypervolemia, Prime Saline Not Diverted

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<td>600</td>
</tr>
<tr>
<td>3</td>
<td>If Prime Saline is Not Diverted to the Waste Bag, Enter N</td>
<td>195</td>
</tr>
</tbody>
</table>

| Conclusion | New Fluid Balance (%) (Enter This Value into the Spectra System) | 195    |
## Examples of Post-Run Fluid Balance Calculations for COBE® Spectra™ TPE Procedures

### Hypovolemia, Prime Saline Diverted

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tbody>
<tr>
<td>Enter Final Total AC Volume Used (ml)</td>
<td>284</td>
<td></td>
</tr>
<tr>
<td>Enter AC Volume in Plasma Waste Bag (ml)</td>
<td>228</td>
<td></td>
</tr>
<tr>
<td>Enter Final TPE Replace Volume (ml)</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Enter Final TPE Removed Volume (ml)</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>Enter Volume of Fluid Boluses, Calcium Solution, etc. (ml)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>If Prime Saline Is <strong>Not</strong> Diverted to the Waste Bag, Enter N</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Net Difference (ml)</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td>True Plasma Volume Removed (ml)</td>
<td>972</td>
<td></td>
</tr>
<tr>
<td>True Replacement Volume Given (ml)</td>
<td>751</td>
<td></td>
</tr>
</tbody>
</table>

### Hypervolemia, Prime Saline Not Diverted

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</tr>
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<td></td>
<td>N</td>
</tr>
<tr>
<td>Net Difference (ml)</td>
<td>529</td>
<td></td>
</tr>
<tr>
<td>True Plasma Volume Removed (ml)</td>
<td>972</td>
<td></td>
</tr>
<tr>
<td>True Replacement Volume Given (ml)</td>
<td>1501</td>
<td></td>
</tr>
</tbody>
</table>
It All Started With Data Entry…

Every piece of patient information you entered was used by the COBE Spectra system to calculate the run parameters needed to perform a successful TPE procedure.
Overview of Parameters Calculated Based on Data Entry

Sex, height, and weight

Hct & TBV &
Plasma volume
Replace pump
Fluid balance

AC infusion rate

RBC/Plasma interface

AC Pump
Inlet:AC ratio

Inlet pump

Operational Principles of TPE Procedures
Accurate data entry is very important

The success of the TPE procedure depends on it!