The Secrets of Cryoprecipitate: A Blood Banking Process Improvement

By: Jessie Swanson and Michelle Soland

Manish J. Gandhi, M.D.
Associate Professor of Laboratory Medicine and Pathology
Division of Transfusion Medicine

Michelle Soland
Clinical Laboratory Technologist
Component Laboratory

James R. Stubbs, M.D.
Associate Professor of Laboratory Medicine and Pathology
Chair, Division of Transfusion Medicine

Jessie A. Swanson, M.L.S
Clinical Laboratory Technologist
Component Laboratory

Transfusion Medicine
Department of Laboratory Medicine and Pathology
Mayo Clinic, Rochester, Minnesota
Disclosures

• None

Objectives

• What is cryoprecipitate?
• Product storage/requirements
• Indications for use
• Dosage
• Process improvement
**What is Cryoprecipitate?**

- Cryoprecipitate (cryo) is cold-insoluble proteins that precipitates when FFP is thawed.
- It is rich in plasma proteins:
  - Factor VIII
  - Fibrinogen
  - Factor XIII
  - von Willebrand factor
  - Fibronectin

**How is it Manufactured?**

1. Frozen FFP
   - Same ABO

2. Thaw
   - 1-6°C

3. Centrifuge
   - "heavy" spin

4. Separate
   - supernatant from precipitates

5. Pooling
   - pre-storage pool
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Product Storage

Storage and Shelf Life of Cryo

<table>
<thead>
<tr>
<th>Frozen</th>
<th>Thaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage:</td>
<td>Quick thaw:</td>
</tr>
<tr>
<td>≤ -18°C</td>
<td>30-37°C</td>
</tr>
<tr>
<td>Shelf life:</td>
<td>Storage:</td>
</tr>
<tr>
<td>1 year</td>
<td>20-24°C</td>
</tr>
<tr>
<td></td>
<td>Shelf life:</td>
</tr>
<tr>
<td></td>
<td>6 hours</td>
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Product Requirements

• FDA regulations: test 4 pools per month

• Each pool must contain a minimum of 80 International Units (IU) of Factor VIII and 150 mg of fibrinogen times the number of units in the pool.

• 5-pool:
  • Factor VIII ≥ 400 IU/pool
  • Fibrinogen ≥ 750 mg/pool
Indications for Use

- Patients that benefit from cryoprecipitate:
  - Fibrinogen deficiency
  - Disseminated Intravascular Coagulation (DIC)
  - Massive transfusion with bleeding
  - Inherited disorder of fibrinogen
  - Uremic bleeding

Selection and Administration

- ABO compatible
- Rh incompatible
Standard Dose

• The standard adult dose at Mayo Clinic Rochester is 10 units, 2 pools

• External blood suppliers provide blood products to other Mayo campuses
  • They produce pools of 5 units at higher dosages
  • Allowing other Mayo sites to drop their standard adult dose, from 10 to 5 units

Standard Dose

• Benchmark with other Mayo sites and implement a method that produces higher fibrinogen levels
Case Study

- Middle aged man underwent a redo aorta operation
- Required a long cardiopulmonary bypass run and cooling to 18°C
- Patient started to bleed a lot
  - New graft caused fibrinogen depletion significantly
- Received 40 units of cryo

Process Improvement

Thawing

- Even thawing
- “Desired consistency”
- Time
- Manipulation
Process Improvement

Thawing

Even thawing
“Desired consistency”
Time
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Even thawing
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Process Improvement

Centrifuge

Time  RPM  Brake

Process Improvement

Centrifuge

Time  RPM  Brake

MAYO CLINIC LABORATORIES
Process Improvement

Separation

- Raised shelf
- Coolants
- Single cryo weight

Process Improvement

Pooling

- Scraper
- No rinse
- Reduce heat transfer
Implementation

- Validated a process that had an average of ≥ 1,450 mg/unit of fibrinogen
- Implemented new process 11/5/18

<table>
<thead>
<tr>
<th>Regulatory Requirements</th>
<th>Average Pre-Intervention Results</th>
<th>Average Post-Intervention Results</th>
<th>Goal Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor VIII</strong> (IU/pool)</td>
<td>≥ 400</td>
<td>823</td>
<td>782*</td>
</tr>
<tr>
<td><strong>Fibrinogen</strong> (mg/pool)</td>
<td>≥ 750</td>
<td>1389</td>
<td>1574*</td>
</tr>
</tbody>
</table>

*As of 6/3/19
Process Improvement Conclusion

• Help standardize the cryoprecipitate dosage and benefit the patient, as the needs of the patient come first.
  • Reduce donor exposure, increase inventory, and potentially cost saving for patients
• With continual monitoring and potential improvements the dosage change will become effective.

Summary

• Cryoprecipitate
• Storage
  • Frozen
  • Thawed
• Indications
• Standard Dose
• Process Improvement
References