

**INTERCEPT® Blood System for Cryoprecipitation Package Insert**  
**For the manufacturing of Pathogen Reduced Plasma, Cryoprecipitate Reduced**

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#### **Rx Only**

**Caution: Federal law restricts this device to sale by or on the order of a licensed healthcare practitioner.**

August 28, 2024

#### **INTENDED USE**

The INTERCEPT Blood System for Cryoprecipitation is intended to provide a functionally closed system for the production of Pathogen Reduced Plasma, Cryoprecipitate Reduced.

Pathogen Reduced Plasma, Cryoprecipitate Reduced is indicated for transfusion or therapeutic plasma exchange (TPE) in patients with thrombotic thrombocytopenic purpura (TTP). It may be used to provide coagulation factors, except fibrinogen, factor VIII, factor XIII, and von Willebrand factor (vWF), for transfusion support of patients with appropriate clinical indications.

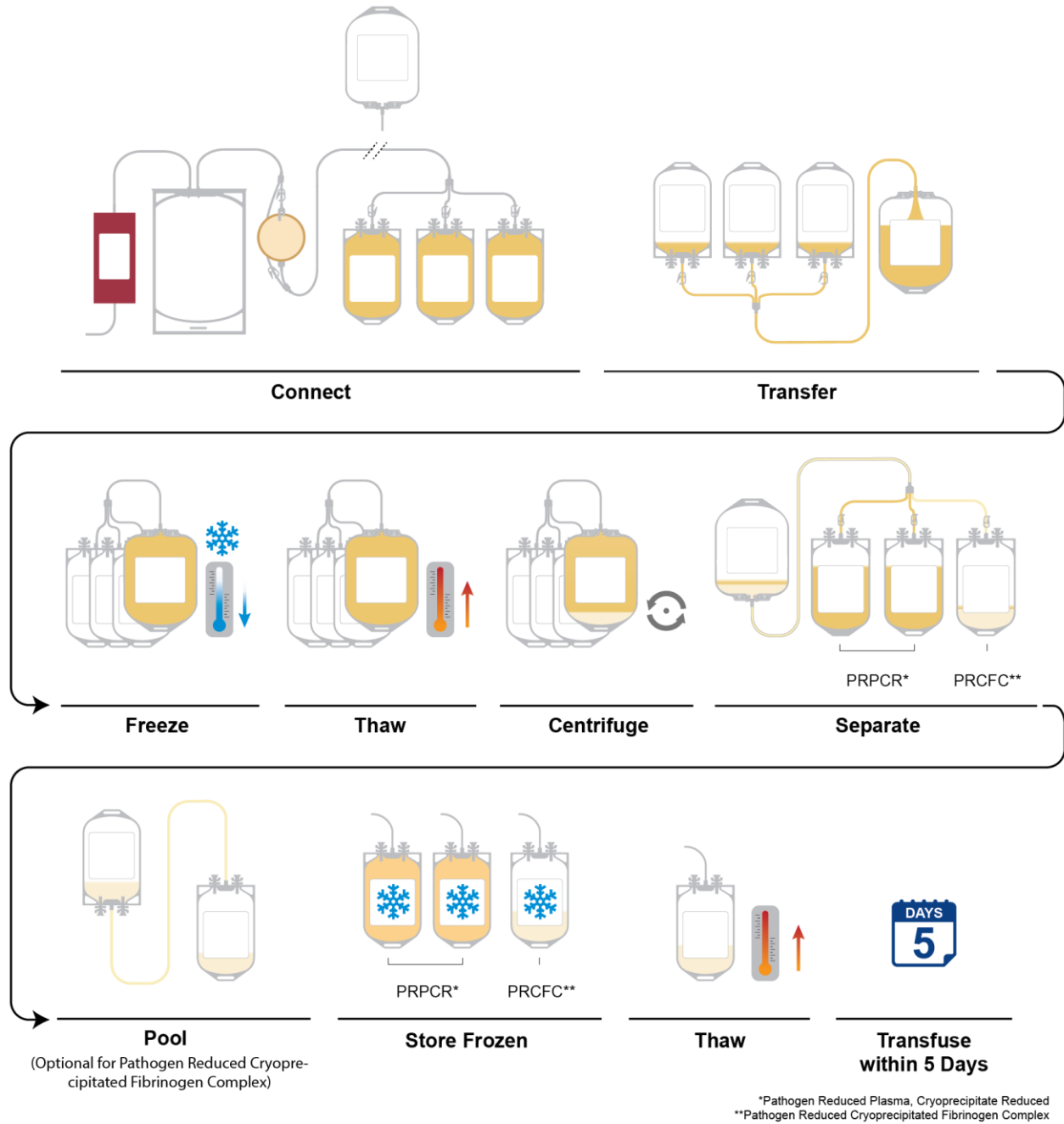
#### **DEVICE DESCRIPTION**

The INTERCEPT Blood System for Cryoprecipitation contains a sterile, non-pyrogenic, single-use, fluid path processing container – the FIBRICEPT™ Processing Container – (INT3230) for use in production of Pathogen Reduced Plasma, Cryoprecipitate Reduced.

The operating principle for the INTERCEPT Blood System for Cryoprecipitation is illustrated in **Figure 1**. INTERCEPT Blood System processed plasma is transferred to the INT3230 processing container and frozen at -18°C or colder within 24 hours of blood draw for pooled whole blood derived plasma or within 8 hours of apheresis collection. The INT3230 processing container remains frozen for up to 30 days, at which time the INTERCEPT processed plasma is thawed and centrifuged. After centrifugation the supernatant is transferred to two of the three final storage containers and the cryoprecipitate pellet is reconstituted into remaining supernatant and transferred to the third final storage container. All three blood components may be frozen and stored at -18°C or colder until thaw prior to transfusion.

Pathogen inactivation of plasma using the INTERCEPT Blood System, and processing in a functionally closed system, enables up to 5 days of post-thaw storage of Pathogen Reduced Plasma, Cryoprecipitate Reduced at 1–6°C.

**Figure 1 Illustration of the INTERCEPT Blood System for Cryoprecipitation**



**DEVICE PERFORMANCE**

Pathogen Reduced Plasma, Cryoprecipitate Reduced is prepared using the INTERCEPT Blood System for Cryoprecipitation from plasma that has been processed with the INTERCEPT Blood System for Plasma.<sup>1</sup> The INTERCEPT Blood System inactivates a broad spectrum of viruses, gram-positive and gram-negative bacteria, spirochetes, parasites and leukocytes (see **Table 1**).<sup>1-8</sup> There is no pathogen inactivation process that has been shown to eliminate all pathogens. Certain non-enveloped viruses (e.g., hepatitis A virus (HAV), hepatitis E virus (HEV), parvovirus B19 and poliovirus) and *Bacillus cereus* spores have demonstrated resistance to the INTERCEPT process.

**Table 1 Pathogen Inactivation Efficacy of INTERCEPT Processed Plasma Used to Prepare Pathogen Reduced Plasma, Cryoprecipitate Reduced**

Pathogen	Log Reduction
<b>Virus (Enveloped)<sup>1-4</sup></b>	
HIV-1 IIIB, cell-associated	≥6.2
HIV-1 IIIB cell-free	≥6.1
DHBV <sup>a</sup>	4.4 to 4.5
BVDV <sup>b</sup>	>4.3
HTLV-I	≥4.1
HTLV-II	≥4.7
West Nile virus	>5.5
SARS-Associated Coronavirus	≥4.0
Chikungunya virus (CHIKV)	6.5
Influenza A virus (H <sub>5</sub> N <sub>1</sub> Avian Influenza)	≥5.7
<b>Virus (Non-Enveloped)<sup>1,4</sup></b>	
Parvovirus B19	1.8
Bluetongue virus	4.2
Adenovirus 5	≥5.6
<b>Bacteria<sup>1,5</sup></b>	
<i>Klebsiella pneumoniae</i>	>6.0
<i>Enterobacter cloacae</i>	≥6.7
<i>Pseudomonas aeruginosa</i>	>6.8
<i>Yersinia enterocolitica</i>	≥6.6
<i>Staphylococcus epidermidis</i>	>6.8
<i>Staphylococcus aureus</i>	>6.2
<i>Treponema pallidum</i>	≥5.4
<i>Borrelia burgdorferi</i>	≥9.9
<i>Anaplasma phagocytophilum</i> (HGE agent)	≥3.6
<b>Protozoan Parasite<sup>6,7</sup></b>	
<i>Plasmodium falciparum</i>	>6.5
<i>Babesia microti</i>	≥4.9
<i>Trypanosoma cruzi</i>	>6.7

<sup>a</sup>DHBV model virus for HBV

<sup>b</sup>BVDV model virus for HCV

Using a limiting dilution assay (LDA), plasma processed with the INTERCEPT Blood System exhibited a 4 log<sub>10</sub> reduction of viable T cells.<sup>9</sup> Using a DNA modification assay, plasma processed with the INTERCEPT Blood System demonstrated an average of one amotosalen adduct every 83 base pairs in leukocytes.<sup>10</sup>

Pathogen Reduced Plasma, Cryoprecipitate Reduced serves as a source for plasma proteins with reduced levels of fibrinogen, factor XIII, vWF, and factor VIII compared to unfractionated FFP. Pathogen Reduced Plasma, Cryoprecipitate Reduced should be ABO compatible with the recipient.

#### *In Vitro Characterization of Pathogen Reduced Plasma, Cryoprecipitate Reduced*

In an n=60 *in vitro* study, two ABO-matched whole blood-derived plasma components were combined per replicate and processed with the INTERCEPT Blood System for Plasma within 18 to 22 hours of collection. The INTERCEPT processed plasma was frozen at -18°C or colder. After 26–28 days of storage, the INTERCEPT processed plasma was thawed at 1°C to 6°C, centrifuged, the precipitate removed, and the cryoprecipitate reduced plasma supernatant refrozen at -18°C or colder for 14–23 days before final thaw. The thawed components were stored at 1°C to 6°C for 24 hours before analysis.

*In vitro* characterization of the thawed Pathogen Reduced Plasma, Cryoprecipitate Reduced components is presented in **Table 2**.

**Table 2** *In Vitro* Characterization of Pathogen Reduced Plasma, Cryoprecipitate Reduced

Parameter	Results
<b>pH</b>	7.26 ± 0.03 [7.21–7.35]
<b>Osmolality (mOsm)</b>	325 ± 11 [309–348]
<b>Total Protein (g/L)</b>	54 ± 2 [48–58]
<b>Prothrombin Time (PT) (seconds)</b>	15 ± 1 [13–17]
<b>Activated Partial Thromboplastin Time (aPTT) (s)</b>	46.4 ± 3.6 [38.6–61.3]
<b>Thrombin Generation (ETP) (nM·Min)</b>	1156 ± 208 [507–1812]
<b>Fibrinogen (g/L)</b>	1.47 ± 0.15 [1.15–1.86]
<b>Factor II (IU/mL)</b>	0.77 ± 0.07 [0.57–0.94]
<b>Factor V (IU/mL)</b>	0.66 ± 0.12 [0.44–1.12]
<b>Factor VII (IU/mL)</b>	0.83 ± 0.21 [0.54–1.85]
<b>Factor VIII:C (IU/mL)</b>	0.15 ± 0.05 [0.54–1.85]
<b>Factor IX (IU/mL)</b>	1.00 ± 0.19 [0.72–1.44]
<b>Factor X (IU/mL)</b>	0.86 ± 0.13 [0.61–1.14]
<b>Factor XI (IU/mL)</b>	1.02 ± 0.29 [0.67–1.83]
<b>Factor XIII Antigen (mg/dL)</b>	2.0 ± 0.3 [1.3–2.8]
<b>vWF ristocetin cofactor activity (IU/mL)</b>	0.10 ± 0.0 [0.1–0.1]
<b>vWF (Antigen) (IU/mL)</b>	0.18 ± 0.07 [0.08–0.48]
<b>ADAMTS13 (Antigen) (%)</b>	63 ± 9 [46–89]
<b>ADAMTS13 (Function) (%)</b>	84 ± 11 [61–117]
<b>Protein C (IU/mL)</b>	0.99 ± 0.14 [0.72–1.45]
<b>Protein S (IU/mL)</b>	0.83 ± 0.10 [0.61–1.11]
<b>Alpha-2-plasmin inhibitor (IU/mL)</b>	0.86 ± 0.13 [0.64–1.15]
<b>Thrombin-Antithrombin Complexes (ug/L)</b>	6.49 ± 2.58 [1.93–12.12]
<b>Factor VIIa (ng/mL)</b>	1.80 ± 2.93 [0.37–21.47]
<b>C3a (ng/mL)</b>	273 ± 55 [159–476]

Mean ± SD [range], n=60

## **CONTRAINDICATIONS**

- Contraindicated for preparation of blood components intended for patients with a history of hypersensitivity reaction to amotosalen or other psoralens.
- Contraindicated for preparation of blood components intended for neonatal patients treated with phototherapy devices that emit a peak energy wavelength less than 425 nm, or have a lower bound of the emission bandwidth <375 nm, due to the potential for erythema resulting from interaction between ultraviolet light and amotosalen.
- Pathogen Reduced Plasma, Cryoprecipitate Reduced should not be used for replacement of coagulation factors known to be depleted in this product: fibrinogen, factor VIII, vWF and factor XIII.

NOTE: include information about these contraindications in the labeling provided with transfusable blood component products prepared using the INTERCEPT Blood System.

## **WARNINGS AND PRECAUTIONS**

- Only the INTERCEPT Blood System for Cryoprecipitation is approved for use to produce Pathogen Reduced Plasma, Cryoprecipitate Reduced.

NOTE: include these “Warnings and Precautions” in the labeling provided with transfusable blood component products prepared using the INTERCEPT Blood System.

## INSTRUCTIONS FOR USE

These instructions are for the use of the INTERCEPT Blood System for Cryoprecipitation to produce Pathogen Reduced Cryoprecipitated Fibrinogen Complex and Pathogen Reduced Plasma, Cryoprecipitate Reduced. A single 60–100 mL component of Pathogen Reduced Cryoprecipitated Fibrinogen Complex, and two components of Pathogen Reduced Plasma, Cryoprecipitate Reduced, are made from each INTERCEPT Blood System for Plasma set input defined here.

Pathogen Reduced Cryoprecipitated Fibrinogen Complex is produced from cryoprecipitation of cold, insoluble proteins from plasma that has been processed with the INTERCEPT Blood System for Plasma. Final components are produced using the INTERCEPT Blood System for Cryoprecipitation. The supernatant from this process is Pathogen Reduced Plasma, Cryoprecipitate Reduced.

### *Input Plasma*

Input for this process requires plasma that has been processed with the INTERCEPT Blood System for Plasma but not yet frozen in the final storage containers. The plasma may be from one unit of apheresis or two units of whole blood-derived plasma.

The INTERCEPT process must be initiated to allow freezing of INTERCEPT processed plasma within 24 hours after collection of the first unit in the pool for whole blood-derived plasma or within 8 hours of apheresis collection.

### *Initial Setup*

**Equipment Provided:** One (1) INTERCEPT Blood System for Cryoprecipitation

**Equipment Required But Not Provided:** sterile connecting device (SCD), tube sealer, plasma freezer, centrifuge, top-pan balance and/or scale, labels for final storage containers, label printer, temperature-controlled circulating water bath or refrigerator

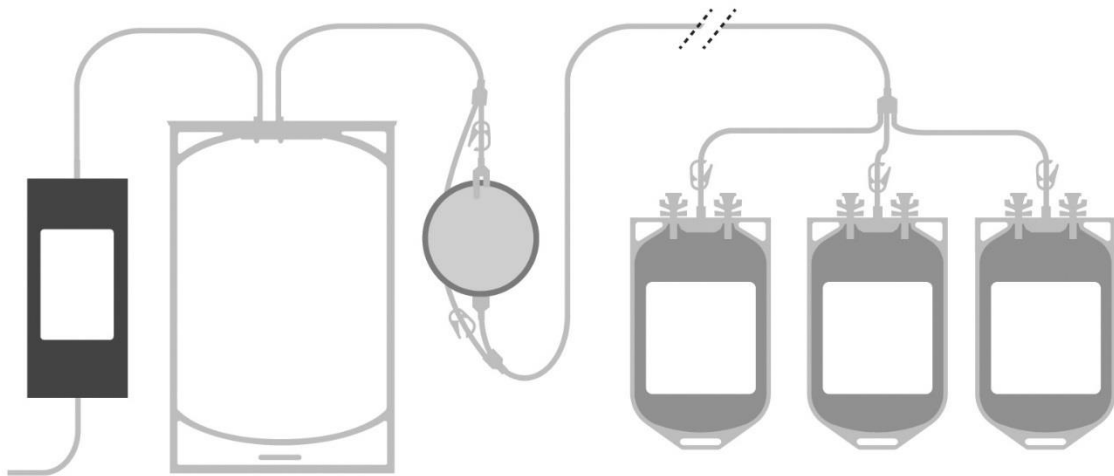


## Processing

### I. Preparations Prior to Freezing the Plasma

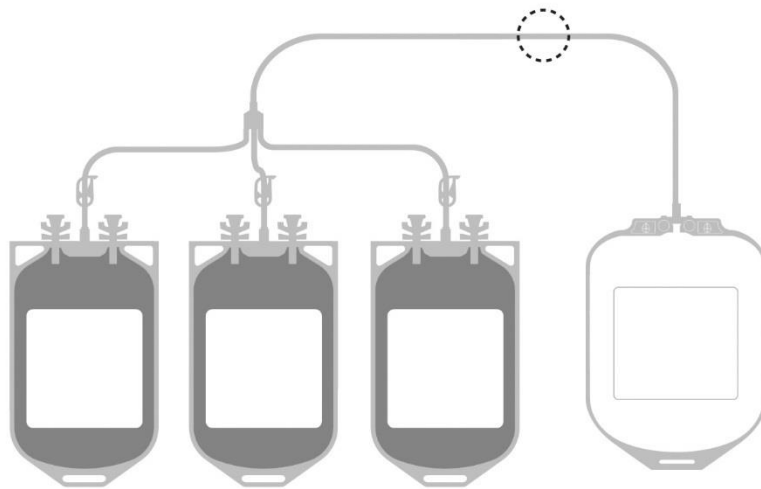
1. Refer to SPC 00818-AW, INTERCEPT Blood System for Plasma. Complete the steps for making INTERCEPT processed plasma, Section III, Step 1 through Step 11. **Do not** redistribute plasma volume, **do not** disconnect individual storage containers, and **do not** freeze the containers. (i.e., Do not complete Step 12 through Step 16).
2. Disconnect the storage containers from the plasma set by heat sealing above the 3-way junction of the 3 storage containers (**Figure 2**).

**Figure 2**



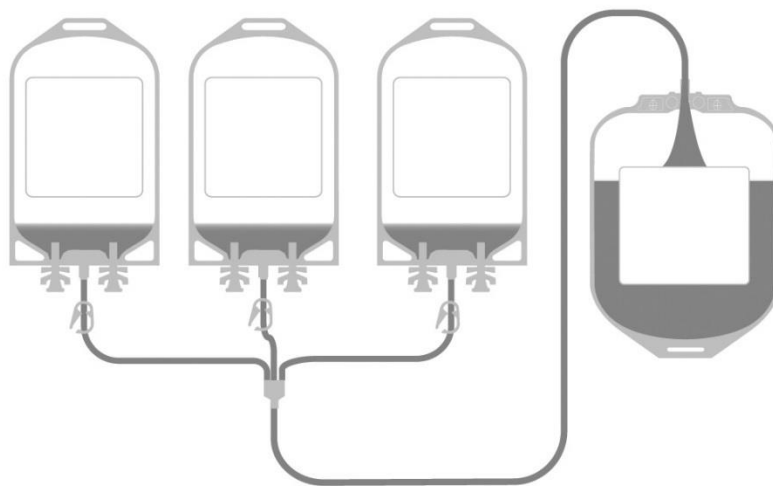
3. Remove the INTERCEPT Blood System for Cryoprecipitation from its packaging.
4. Label the INTERCEPT Blood System for Cryoprecipitation with the donation identification number (DIN).
5. Sterile connect the INTERCEPT Blood System for Cryoprecipitation to the INTERCEPT processed plasma storage containers containing INTERCEPT processed plasma (**Figure 3**).

**Figure 3**



6. Open the clamps and transfer the INTERCEPT processed plasma to the INTERCEPT Blood System for Cryoprecipitation via gravity flow. The tubing and 3 storage containers should remain connected (**Figure 4**).

**Figure 4**

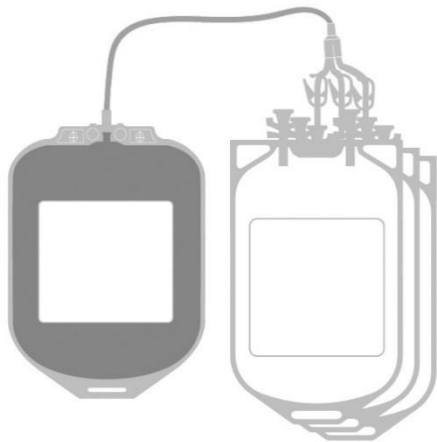


7. After the plasma is transferred, express air from the INTERCEPT Blood System for Cryoprecipitation into the 3 plasma storage containers as needed.
8. Close the clamp on the lines of each of the plasma storage containers. Do not disconnect any of the containers at this point.

## II. Freezing INTERCEPT Processed Plasma in the INTERCEPT Blood System for Cryoprecipitation

1. Organize the INTERCEPT Blood System for Cryoprecipitation, tubing, and connected containers. The INTERCEPT Blood System for Cryoprecipitation and the 3 containers should remain connected during freezing (**Figure 5**).

**Figure 5**



2. Place tubing between the INTERCEPT Blood System for Cryoprecipitation and the connected storage containers to minimize tubing exposure and movement.
3. Place in a freezer that is  $-18^{\circ}\text{C}$  or colder.
4. Store at  $-18^{\circ}\text{C}$  or colder for no more than 30 days.

## III. Thawing INTERCEPT Processed Plasma in the INTERCEPT Blood System for Cryoprecipitation

1. Carefully remove the INTERCEPT Blood System for Cryoprecipitation, tubing, and connected containers from the freezer.
2. After removal from the freezer, allow sufficient time at ambient temperature for the tubing to thaw sufficiently to regain flexibility.
3. Place the INTERCEPT Blood System for Cryoprecipitation and connected containers at  $1^{\circ}\text{C}$  to  $6^{\circ}\text{C}$  until the plasma is sufficiently thawed.

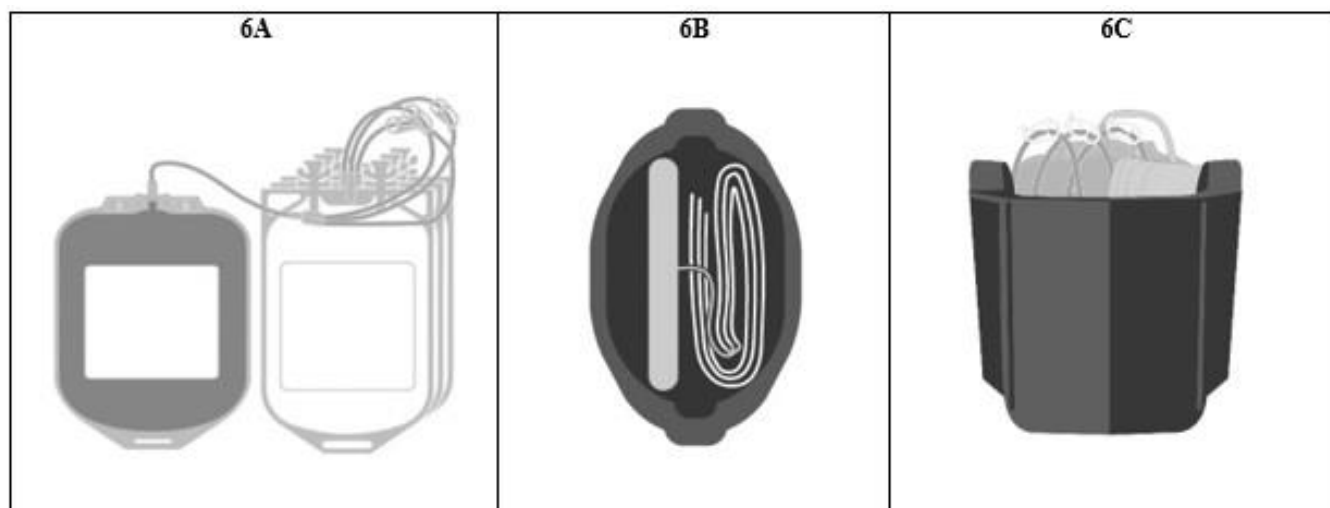
NOTE: Thaw time and specific thawing practices must be characterized by the blood center.

4. When the plasma has completely thawed, remove the INTERCEPT Blood System for Cryoprecipitation, tubing, and connected containers from the water bath or refrigerator.

#### IV. Centrifugation

1. Organize and place the INTERCEPT Blood System for Cryoprecipitation, tubing, and containers in a centrifuge liner. An example is shown below of the contents (**Figure 6A**) and placement (**Figure 6B** – top view, **Figure 6C** – side view). White clamps should be positioned prior to folding to avoid compression during centrifugation (**Figure 6A**). NOTE: method of loading in the centrifuge liner and clamp placement must be established by the blood center.

**Figure 6**



2. Place the liner into the centrifuge bucket and balance with any other liners following centrifuge manufacturer's instructions.
3. Centrifuge at 1°C to 6°C using a hard spin. NOTE: Centrifuge time and settings must be characterized by the blood center.
4. Carefully remove the INTERCEPT Blood System for Cryoprecipitation, tubing, and connected containers from the liner.
5. Inspect to ensure cryoprecipitate pellet is visible and there are no breaks or leaks. Take care not to disturb the pellet during handling.
6. If separation is not performed immediately, store the items at 1°C to 6°C until ready for separation.

#### V. Separation into Components

1. Open the clamps leading to any two of the final storage containers. One clamp on the tubing leading to the third storage container will remain closed.
2. Drain or express the Pathogen Reduced Plasma, Cryoprecipitate Reduced supernatant from the INTERCEPT Blood System for Cryoprecipitation into two open final storage containers. Retain 60 mL to 100 mL of cryoprecipitate and supernatant within the INTERCEPT Blood System for Cryoprecipitation.
3. Expel air from the two final storage containers containing Pathogen Reduced Plasma, Cryoprecipitate Reduced into the INTERCEPT Blood System for Cryoprecipitation, as needed.
4. Clamp off INTERCEPT Blood System for Cryoprecipitation with hemostat or clamp.

5. Distribute the Pathogen Reduced Plasma, Cryoprecipitate Reduced evenly as needed between the two final storage containers. Each storage container can hold up to a maximum of 325 mL.
6. Disconnect the two final storage containers with the Pathogen Reduced Plasma, Cryoprecipitate Reduced by heat sealing below the 3-way junction. Allow sufficient tubing length for segments if needed. Discard the white clamps.
7. Apply blood center label for Pathogen Reduced Plasma, Cryoprecipitate Reduced to each disconnected container.
8. Resuspend the cryoprecipitate in the residual supernatant in the INTERCEPT Blood System for Cryoprecipitation.
9. Open the clamp leading to the remaining empty final storage container.
10. Transfer the Pathogen Reduced Cryoprecipitated Fibrinogen Complex from the INTERCEPT Blood System for Cryoprecipitation into the final storage container.
11. Expel air from the final storage container back into the INTERCEPT Blood System for Cryoprecipitation, as needed.
12. Disconnect the final storage container by heat sealing below the 3-way junction. Allow sufficient tubing length for segments if needed. Discard the white clamp.
13. Apply blood center label for Pathogen Reduced Cryoprecipitated Fibrinogen Complex to the final storage container or label after pooling multiple Pathogen Reduced Cryoprecipitated Fibrinogen Complex components into one final storage container. Each storage container can hold up to a maximum of 325 mL.
14. Organize components into packaging for freezing and storage.
15. Freeze immediately following blood center procedures.
16. Store all three components at -18°C or colder.
17. Discard the INTERCEPT Blood System for Cryoprecipitation as Biohazardous Waste.

NOTE: Pathogen Reduced Plasma, Cryoprecipitate Reduced must be stored in the INTERCEPT Blood System for Plasma storage containers.

NOTE: Pathogen Reduced Plasma, Cryoprecipitate Reduced may be stored at -18°C or colder for up to 12 months from the date of collection of the first donation in the input plasma pool.

## STORAGE AND HANDLING

### INTERCEPT Blood System for Cryoprecipitation

- The INTERCEPT Blood System for Cryoprecipitation is designed to be a functionally closed system for use with the INTERCEPT Processing Set for plasma. Pathogen Reduced Plasma, Cryoprecipitate Reduced must be stored in one of the three final storage containers of the INTERCEPT Processing Set for plasma.
- The INTERCEPT Blood System for Cryoprecipitation is for single use only. Do not reuse.
- Do not use the INTERCEPT Blood System for Cryoprecipitation if the container or its packaging is damaged or shows any sign of deterioration.
- Protect the packaging, container, and tubing from sharp objects.
- Do not store processing set above 25°C.
- Do not freeze prior to use.

### *Pathogen Reduced Plasma, Cryoprecipitate Reduced*

- Pathogen Reduced Plasma, Cryoprecipitate Reduced may be stored at -18°C (-0.4°F) or colder for up to 12 months.
- Thaw according to institutional procedures. If using a water bath for thawing Pathogen Reduced Plasma, Cryoprecipitate Reduced, place in liquid-impermeable plastic overwrap. Do not allow product to contact water. Do not refreeze post-thaw.
- Do not administer Pathogen Reduced Plasma, Cryoprecipitate Reduced if there is evidence of container breakage or of thawing during frozen storage.
- If Pathogen Reduced Plasma, Cryoprecipitate Reduced is pooled or aliquoted post thaw without using an FDA-cleared sterile connection device, transfuse within 4 hours of pooling or aliquoting.
- Pathogen Reduced Plasma, Cryoprecipitate Reduced may be stored at 1°C to 6°C for up to 5 days post thaw.
- Discard unused, thawed Pathogen Reduced Plasma, Cryoprecipitate Reduced at the end of 5 days post thaw as medical waste according to institutional and local regulations.

## NONCLINICAL TOXICOLOGY

Nonclinical toxicology studies have not been performed with the INTERCEPT Blood System for Cryoprecipitation.

Pathogen Reduced Plasma, Cryoprecipitate Reduced is prepared from INTERCEPT processed plasma. *In vitro* studies using whole blood-derived plasma frozen within 24 hours after phlebotomy (PF24) were used to evaluate the concentration of amotosalen in precursor plasma and Pathogen Reduced Plasma, Cryoprecipitate Reduced fractions. The average concentrations in precursor plasma and Pathogen Reduced Plasma, Cryoprecipitate Reduced were comparable and demonstrate that there is no enrichment of amotosalen in any fraction; and thus, the safety data from the nonclinical, clinical, and post-marketing studies with INTERCEPT processed plasma are informative about the safety of Pathogen Reduced Plasma, Cryoprecipitate Reduced.

Nonclinical studies were conducted in mice, rats and dogs to evaluate the potential toxicity of single and repeated exposures to amotosalen, the synthetic psoralen derivative used in the INTERCEPT process to cross-link DNA and RNA. A single, intravenous injection of amotosalen alone resulted in mortality in rats at doses equal to or greater than 35,000-fold the anticipated human exposure from INTERCEPT Blood System processed plasma, on a dose per kilogram body weight basis. Lower doses (4,000- or 20,000-fold greater than the human exposure in dogs and rats, respectively) were not lethal, and resulted in transient clinical signs of toxicity (i.e., piloerection, inactivity, hunched posture and abnormal breathing in rats, and excessive salivation, convulsions, and non-lethal cardiac arrhythmias in dogs). No target organ toxicities were noted at necropsy.<sup>11</sup>

Animal experiments provided no indication of an increased toxicological risk for the use of plasma processed with amotosalen using the INTERCEPT Blood System, as compared to dosing with equivalent volumes of either homologous, untreated plasma, or saline or buffer control. Single-dose studies with INTERCEPT processed plasma in dogs were non-toxic at amotosalen doses of 6,000-fold the expected clinical exposure, and repeated daily dosing in rats and dogs for 28 days with homologous plasma processed with the INTERCEPT Blood System showed no evidence of toxicity at 5,000-fold the expected amotosalen clinical exposure.<sup>11</sup>

Amotosalen was rapidly eliminated following intravenous dosing in mice and rats, with an initial plasma  $t_{1/2}$  of less than one hour. There was no evidence of amotosalen accumulation after repeated exposures over periods as long as 13 weeks. The primary route of excretion of amotosalen and its photo-byproducts was fecal.

No effects on fertility parameters were noted in male or female rats repeatedly dosed with amotosalen. In studies evaluating the effects of amotosalen dosing of pregnant rats or rabbits on embryo-fetal or peri-postnatal development, and in one study of neonatal rats dosed with amotosalen, there was no evidence of teratogenicity, or other reproductive or developmental toxicities.<sup>12</sup> No evidence of genotoxicity or mutagenicity was observed in the *in vitro* or *in vivo* mutagenicity studies of amotosalen.<sup>13</sup> In transgenic mice heterozygous for the p53 tumor suppressor gene, there was no evidence of carcinogenicity after repeated, three times weekly dosing for 6 months with amotosalen in plasma, at cumulative weekly

doses approximately 150 times the human exposure from a single infusion of INTERCEPT processed plasma.<sup>11</sup>

## **CLINICAL STUDIES**

Pathogen Reduced Plasma, Cryoprecipitate Reduced is indicated for transfusion or therapeutic plasma exchange in patients with TTP, and it may be used to provide coagulation factors except fibrinogen, factor VIII, factor XIII, and vWF. For treatment of TTP the critical parameter is retention of ADAMTS13 activity, reduced vWF (including high molecular weight forms), and retention of sufficient hemostatic capacity and anti-thrombotic factors to support clinical hemostasis during plasma exchange.

The content of albumin, immunoglobulins and coagulation factors in Pathogen Reduced Plasma, Cryoprecipitate Reduced is similar to that of Fresh Frozen Plasma, except that the levels of fibrinogen, factor VIII, factor XIII and vWF are substantially reduced by the cryoprecipitation process.<sup>14</sup>

Pathogen Reduced Plasma, Cryoprecipitate Reduced retains a high level of ADAMTS13 activity and of the anti-thrombotic proteins Protein S, alpha-anti-plasmin inhibitor, and Protein C. The levels of fibrinogen, factor VIII, and vWF were depleted. The levels of factors II, VII, IX, X, and XI, were retained at levels adequate for hemostasis and within reference range for unmanipulated plasma (50–150%). The parameters for assessment of activation (thrombin-antithrombin complexes, factor VIIa, and C3a) did not demonstrate excessive activation. Despite the expected depletion of factor VIII to an average level of  $0.15 \pm 0.05$  IU/mL, there was retention of thrombin generation activity with average ETP levels of  $1156 \pm 208$  nM·min, albeit reduced relative to unmanipulated plasma, indicating residual hemostatic capacity. The ETP activity indicates sufficient hemostatic capacity for transfusion to support hemostasis in clinical settings that do not require fibrinogen, factor VIII or factor XIII replacement. In addition, the pH, osmolality, and total protein content were retained within physiologic levels.

### **Summary of Safety of Pathogen Reduced Plasma, Cryoprecipitate Reduced**

There are no specific clinical safety studies for Pathogen Reduced Plasma, Cryoprecipitate Reduced.

Pathogen Reduced Plasma, Cryoprecipitate Reduced is prepared from INTERCEPT processed plasma and contains the comparable concentrations of residual amotosalen as INTERCEPT processed plasma.

The safety data from the nonclinical, clinical, and post-marketing studies with INTERCEPT processed plasma are informative about the safety of Pathogen Reduced Plasma, Cryoprecipitate Reduced.

Studies with Pathogen Reduced Plasma, Cryoprecipitate Reduced in pregnant women or pediatric patients have not been conducted. Pathogen Reduced Plasma, Cryoprecipitate Reduced is produced from INTERCEPT processed plasma, which has been used in the treatment of pregnant and pediatric patients, including neonates. No unexpected adverse events associated with transfusion of INTERCEPT processed plasma to pregnant women or children have been reported.<sup>15</sup> Assessment of safety for INTERCEPT processed plasma has relied on validated nonclinical studies in appropriate animal models, controlled clinical trials, and post-marketing surveillance studies, including in countries with active hemovigilance programs, such as France. The nonclinical studies in reproductive animal models and



neonatal animal models established high safety margins in these populations using platelet and plasma components.

INTERCEPT processed plasma has been in clinical use in the European Union for 15 years for treatment of congenital coagulopathy including fibrinogen deficiency, acquired coagulopathy including liver transplant, and for therapeutic plasma exchange (TPE). Each of these indications was supported by clinical trials. TPE is of specific interest because this requires large volume exposure to plasma processed with amotosalen. Long-term surveillance studies of TPE patients have demonstrated no excess treatment related morbidity indicative of safety.<sup>16-19</sup> Post-marketing surveillance studies that have included neonatal and children to age 18 have not detected any adverse events specifically related to INTERCEPT processed plasma transfusion; and these studies have included longitudinal exposures for many of these patients including liver transplant.<sup>20-22</sup> On the basis of the multi-year clinical experience with INTERCEPT processed plasma, there are no safety signals indicative of excess treatment related morbidity.<sup>15</sup>

## REFERENCES

1. Singh Y, Sawyer L, Pinkoski L, et al. Photochemical treatment of plasma with amotosalen and long-wavelength ultraviolet light inactivates pathogens while retaining coagulation function. *Transfusion* 2006;46:1168-77.
2. Tsetsarkin KA, Sampson-Johannes A, Sawyer L, Kinsey J, Higgs S, Vanlandingham DL. Photochemical inactivation of chikungunya virus in human apheresis platelet components by amotosalen and UVA light. *The American journal of tropical medicine and hygiene* 2013;88:1163-9.
3. Sawyer L, Dupuis K, Sampson-Johannes A, Kinsey J. Inactivation of influenza A H5N1 and Lymphocytic Choriomeningitis virus (LCMV) by the INTERCEPT Blood System (IBS). *Transfusion* 2008;48:88A.
4. Stramer SL, Hollinger FB, Katz LM, et al. Emerging infectious disease agents and their potential threat to transfusion safety. *Transfusion* 2009;49:1S - 29S.
5. Sawyer L, Kodner C, Johnson R, et al. Inactivation of transfusion-transmitted vector-borne pathogens. *Vox Sang* 2009;96:233.
6. Grellier P, Benach J, Labaied M, et al. Photochemical inactivation with amotosalen and long-wavelength ultraviolet light of Plasmodium and Babesia in platelet and plasma components. *Transfusion* 2008;48:1676-84.
7. Van Voorhis WC, Barrett LK, Eastman RT, Alfonso R, Dupuis K. Trypanosoma cruzi inactivation in human platelet concentrates and plasma by a psoralen (amotosalen HCl) and long-wavelength UV. *Antimicrob Agents Chemother* 2003;47:475-9.
8. Arslan Ö, Ozkul A, Dupuis K, Sahin F, Stassinopoulos A. Inactivation of Crimean-Congo Hemorrhagic Fever Virus (CCHFV) in Full Units of Human Plasma Using Amotosalen and UVA. *Vox Sang* 2013;105:155-6.
9. Castro G, Merkel PA, Giclas HE, et al. Amotosalen/UVA treatment inactivates T cells more effectively than the recommended gamma dose for prevention of transfusion-associated graft-versus-host disease. *Transfusion* 2018;58:1506-15.
10. Grass JA, Wafa T, Reames A, et al. Prevention of transfusion-associated graft-versus-host disease by photochemical treatment. *Blood* 1999;93:3140-7.
11. Ciaravino V, McCullough T, Cimino G, Sullivan T. Preclinical safety profile of plasma prepared using the INTERCEPT Blood System. *Vox Sang* 2003;85:171-82.
12. Ciaravino V, Hanover J, Lin L, Sullivan T, Corash L. Assessment of safety in neonates for transfusion of platelets and plasma prepared with amotosalen photochemical pathogen inactivation treatment by a 1-month intravenous toxicity study in neonatal rats. *Transfusion* 2009;49:985-94.
13. Tice RR, Gatehouse D, Kirkland D, Speit G. The pathogen reduction treatment of platelets with S-59 HCl (Amotosalen) plus ultraviolet A light: genotoxicity profile and hazard assessment. *Mutat Res* 2007;630:50-68.
14. Yarranton H, Lawrie AS, Mackie IJ, Pinkoski L, Corash L, Machin SJ. Coagulation factor levels in cryosupernatant prepared from plasma treated with amotosalen hydrochloride (S-59) and ultraviolet A light. *Transfusion* 2005;45:1453-8.
15. Corash L, Benjamin RJ. The role of hemovigilance and postmarketing studies when introducing innovation into transfusion medicine practice: the amotosalen-ultraviolet A pathogen reduction treatment model. *Transfusion* 2016;56 Suppl 1:S29-38.
16. Herbrecht R, Ojeda-Uribe M, Kientz D, et al. Characterization of efficacy and safety of pathogen inactivated and quarantine plasma in routine use for treatment of acquired immune thrombotic thrombocytopenic purpura. *Vox Sang* 2018;10.1111/vox.12663.
17. Cognasse F, Osselaer JC, Messe N, van Hooydonk M, Corash L, Garraud O. Cytokine profiles in platelet components associated with acute transfusion reactions: The role of sCD40L. *Blood* 2006;108:281a.

18. Guignier C, Benamara A, Oriol P, Coppo P, Mariat C, Garraud O. Amotosalen-inactivated plasma is as equally well tolerated as quarantine plasma in patients undergoing large volume therapeutic plasma exchange. *Transfusion clinique et biologique: journal de la Societe francaise de transfusion sanguine* 2018;25:73-7.
19. Garraud O, Malot S, Herbrecht R, et al. Amotosalen-inactivated fresh frozen plasma is comparable to solvent-detergent inactivated plasma to treat thrombotic thrombocytopenic purpura. *Transfusion and apheresis science: official journal of the World Apheresis Association: official journal of the European Society for Haemapheresis* 2019;58:102665.
20. Cazenave J, Waller C, Kientz D, et al. An active hemovigilance program characterizing the safety profile of 7483 transfusions with plasma components prepared with amotosalen and UVA photochemical treatment. *Transfusion* 2010;50:1210-9.
21. Cinqualbre J, Kientz D, Remy E, Huang N, Corash L, Cazenave JP. Comparative effectiveness of plasma prepared with amotosalen-UVA pathogen inactivation and conventional plasma for support of liver transplantation. *Transfusion* 2015;55:1710-20.
22. Knutson F, Osselaer J, Pierelli L, et al. A prospective, active hemovigilance study with combined cohort analysis of 19,175 transfusions of platelet components prepared with amotosalen-UVA photochemical treatment. *Vox Sang* 2015;109:342-52.
23. AABB (2017). Circular of Information for the Use of Human Blood and Blood Components. Bethesda, MD, AABB.
24. Aubry M, Richard V, et al. Inactivation of Zika virus in plasma with amotosalen and ultraviolet A illumination. *Transfusion* 2016;56(1):33-40.
25. Cerus Corporation. "INTERCEPT Blood System for Plasma." Retrieved December 16, 2014, from [http://www.intercept-usa.com/images/resources/files/INTERCEPT\\_Blood\\_System\\_Plasma\\_Package\\_Insert.pdf](http://www.intercept-usa.com/images/resources/files/INTERCEPT_Blood_System_Plasma_Package_Insert.pdf).
26. Ciaravino V, McCullough T, et al. The role of toxicology assessment in transfusion medicine. *Transfusion* 2003;43:1481-1492.
27. Hindawi SI, Hashem AM, et al. Inactivation of Middle East respiratory syndrome-coronavirus in human plasma using amotosalen and ultraviolet A light. *Transfusion* 2018;58(1):52-59.
28. Musso D, Richard V, et al. Inactivation of dengue virus in plasma with amotosalen and ultraviolet A illumination. *Transfusion* 2014;54:2924-2930.
29. Vanlandingham DL, Keil SD, et al. Photochemical inactivation of chikungunya virus in plasma and platelets using the Mirasol pathogen reduction technology system. *Transfusion* 2013;53(2):284-290.

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