Robustness of the INTERCEPT Blood System for Red Blood Cells

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Background

The INTERCEPT™ Blood System for Red Blood Cells (RBCs) is being developed for the inactivation of pathogens and leukocytes in RBC components for transfusion (It utilizes amastuline, an effector, an anchor and a linker (A). The anchor selectively targets nucleic acids where it intercalates and reversibly binds to the helical regions of the molecule. The effector then irreversibly cross-links the nucleic acids at guanine bases thereby preventing nucleic acid replication or transcription (B). The linker is hydrosilylated to release S-300, a nonreactive degradant resulting from the reaction (C).

The proposed EU input specifications for the RBC pathogen inactivation (P) process are 220 to 360 mL of SAG-M RBC, collected in ACD or CPD, which meet the EDQM requirements for Hemoglobin (Hb) and Hematocrit (Hct) for RBCs in additive solution (AS) (Table 1). Within 48 hours of collection input RBCs are added to a processing solution containing GSH followed by amastuline addition (final concentrations of 20 mM GSH/0.2 mM amastuline, based on a 280 mL RBC input). After 16-24 hours hold at 20-25°C, RBCs are centrifuged and the supernant is replaced with SAG-M. PI RBCs were centrifuged and the supernatant was replaced with SAG-M. PI RBCs were centrifuged and the supernatant was replaced with SAG-M.

Methods

RBCs in AS were from apheresis or CPD whole blood (WB) collections; WB was held at 1-6°C or room temperature prior to separation. Input RBCs (n=160) varied by additive solution (AAS and SAG-M), ACD or CPD, which meet the EDQM requirements for Hemoglobin (Hb) and Hematocrit (Hct). The input RBCs in AS contained 38-45 g Hb content <40 g, had an input Hb content of 38–72, 45–52, and 64–70%.

Results

Hct were similar between INTERCEPT treated RBCs and conventional SAG-M RBCs at Day 35, pH, extracellular glucose, Hb concentration and hemolysis were lower in INTERCEPT treated RBCs compared to conventional SAG-M RBCs (Table 3).

Aims

In vitro function was evaluated in PI treated RBCs prepared within and outside the full range of the input specifications and critical processing parameters. The acceptance criteria were those described for conventional leucocyte-depleted RBCs in additive solution or RBCs in AS after 35 days of storage as defined by the Council of Europe (EDQM, 18th Ed.).

Table 1: Input Specifications for the INTERCEPT Blood System for RBCs and for Robustness Function Studies

Table 2: Characteristics of the INTERCEPT RBC Components Used for Robustness RBC Function Studies

Table 3: Robustness RBC Function Studies: in Vivo Parameters of INTERCEPT Treated RBC and Conventional SAG-M RBC after 35 Days of Storage

Conclusions

This evaluation demonstrated the robustness of the INTERCEPT Treatment process with and outside the proposed range of input RBCs and processing conditions. PI treated RBC units met the EDQM guidelines (18th Ed.) for leucocyte depleted RBCs in additive solution with respect to Hct, Hb content and hemolysis at end of storage. All measured in vitro parameters of INTERCEPT treated RBCs, including ATP levels, indicate suitability for transfusion.

The INTERCEPT Blood System for Red Blood Cells is not approved for commercial use.

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