

White Paper

Comparison of leukocyte depleted platelet concentrates prepared in DEHP and non-DEHP systems and stored in BTHC bag with PAS E additive solution

Introduction

Phthalate esters are plasticizers which are needed to soften otherwise rigid PVC. The most common phthalate is di-(2-ethylhexyl) phthalate, known as DEHP. DEHP is used since decades in divers industrial and household products as well as in medical devices such as blood bags, nutrition pockets, tubing, catheter tubes, respiratory masks and dialysis machines. Safety concerns about the long-term health effects of DEHP have been expressed for several high-risk patient groups, such as neonates, infants, pregnant and breast-feeding women, and adults undergoing long-term hemodialysis.ⁱ

Whenever possible, material with low leachability should be used. Today, other plasticizers such as DEHT, DINCH, TOTM, BTHC are being proposed in medical applications such as medical tubing and blood bags.ⁱⁱ Design changes have been implemented by Fresenius Kabi to replace DEHP plasticized components and fully convert platelet pooling systems to alternative plasticizers.

This communication is intended to show the non-inferiority of a non-DEHP platelet pooling system as alternative to systems including DEHP-containing components.

Objective

A European blood center investigated the effects of using non-DEHP blood collection and buffy coat (BC) pooling sets and compared the resulting platelet concentrates (PCs) with PCs prepared with conventional blood collection and BC pooling sets containing DEHP. All blood and platelet processing systems (CompoSelect[®] and CompoStop[™] respectively) – with and without DEHP – were supplied by Fresenius Kabi. Six “non-DEHP” PCs were prepared from 30 BCs. In parallel, ten “DEHP-containing” PCs were prepared from 50 BCs using the same platelet additive solution (PAS-E), the same separation methodology and the same platelet storage container (BTHC-PVC). The separation and leukocyte depletion of the BC pools was performed with a CompoMat G5 and a dedicated protocol. The processing time ranged between 4:00 and 5:50 min:sec. Product volume, platelet (PLT) yield, residual white blood cell count (rWBC), mean platelet volume (MPV), pH, swirl, platelet activation as judged by CD62P expression and degree of apoptosis by annexin V were determined on days 2 and 8 after blood collection. Volume and cell concentrations were assessed on BC-pool, BC-residue and leukocyte depleted PC (LDPC).

Results

Table 1 shows the results (averages of six) of the leukocyte depleted platelet concentrates prepared with the non-DEHP pooling set from BCs prepared from WB collected in non-DEHP systems. All six units had a PLT yield higher than 2.5×10^{11} and less than 0.25×10^6 rWBC, meeting the requirements for platelet and residual white blood cell countⁱⁱⁱ. In addition, all units exhibited swirl and had an average pH of 7.26 at the end of the storage period (day 8). These results are similar to the findings with PCs prepared with the conventional DEHP-containing blood collection and BC pooling sets (see **Table 2**). The results for the cell surface expression of both CD62P and PS indicate for both groups no severe activation or damage of the cells during storage.

Conclusion

Leukocyte depleted platelet concentrates produced following a non-DEHP production chain environment did not show any significant deviation from a quality standpoint, both for hematological, morphological and activation parameters, when compared to PCs manufactured with conventional DEHP-containing disposables over the storage period of 8 days. CompoStop™ BC pooling systems made of non-DEHP components provide the same high-quality platelet concentrates as the DEHP-containing systems. Activation is comparable between both systems.

	Volume (ml)		PLT (10 ⁹ /U)		rWBC (10 ⁶ /U)		MPV		pH		swirling	
m	346	335	319	279	0,17	-	8,5	9,2	7,13	7,26	3	3
sd	7	6	44	40	0,06	-	0,5	0,4	0,03	0,02	0	0
min	338	326	269	230	0,09	-	8	8,6	7,08	7,2	3	3
max	355	341	368	323	0,23	-	9,2	9,6	7,16	7,27	3	3
day of storage	2	8	2	8	2	8	2	8	2	8	2	8

n=6, from 500 ml donation in full non DEHP systems
pools of 5xBC in PAS-E
REF. 1915FR02

Table 1. Performance data with non-DEHP CompoStop™

	Volume (ml)		PLT (10 ⁹ /U)		rWBC (10 ⁶ /U)		MPV		pH		swirling	
m	350	341	351	304	0,10	-	8,4	9,0	7,12	7,18	3	3
sd	4	5	34	29	0,05	-	0,2	0,2	0,21	0,30	0	0
min	343	334	312	269	0,04	-	8,2	8,6	7,09	7,12	3	3
max	358	349	421	362	0,18	-	8,7	9,3	7,15	7,22	3	3
day of storage	2	8	2	8	2	8	2	8	2	8	2	8

n=10, from 500 ml donation in DEHP systems
pools of 5xBC in PAS-E
REF. 2014FR01

Table 2. Performance data with DEHP-containing CompoStop™

References

- ⁱ Sampson J, et al. *DEHP-plasticised PVC: relevance to blood services*. Transfus. Med. 2011 Apr;21(2):73-83.
- ⁱⁱ Ph. Eur. *Seeks feedback on alternatives to DEHP for blood bags*. European Directorate for the Quality of Medicines & HealthCare. [Online] 2017, accessed 5 January 2021, https://www.edqm.eu/sites/default/files/pheur_enquiry_on_plastised_pvc_04052017_en.pdf.
- ⁱⁱⁱ EDQM Guidelines, 20th Edition, 2020.