IN VITRO QUALITY AND STORAGE STABILITY OF PLATELET CONCENTRATES AFTER THERAFLEX UV TREATMENT

Tolksdorf F[1], Walker W H[1], Mohr H[2], Gravemann U[2], Müller T H[2]
[1]MacoPharma, Langen, Germany
[2]Blood Centre of the German Red Cross Chapters of NSTOB, Institute Springe, Germany

DGTI Congress, Friedrichshafen, September 2007

INTRODUCTION

Pathogen Inactivation technologies are proactive measures to enhance the safety of platelet transfusions. Their use can be effective also against emerging unknown pathogens. Current procedures need chemicals like photosensitizers. We developed a procedure, which allows an efficient reduction of pathogens (e.g. bacteria and viruses) in plasma-reduced platelet concentrates (PCs) using short-wavelength UV light (UVC) in combination with strong agitation, i.e. there is no photoactive compound needed (THERAFLEX UV Platelets technology). The irradiation device developed for this purpose is equipped with a light source emitting UVC light at a wavelength of 254 nm. Moreover a mechanism for orbital agitation is installed. UVC irradiation is microprocessor-controlled. Relevant treatment parameters are monitored throughout the entire treatment thus allowing a well documented and reproducible process. PCs are treated in a twin-bag kit, which comprises of a highly UV-permeable irradiation bag and a container for extended platelet storage. In the present study we investigated the influence of the THERAFLEX UV treatment on in vitro parameters of PCs and on their storage stability.

MATERIALS & METHODS

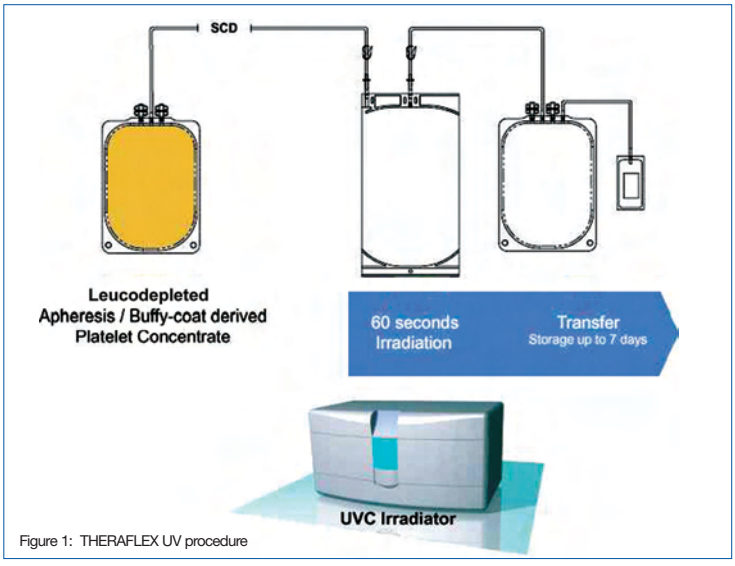

Figure 1: THERAFLEX UV procedure

Plasma-reduced PCs were treated with the THERAFLEX UV procedure (Fig.1) and stored until day 8 after blood donation (day 6 after treatment). The in vitro quality of UVC treated PCs was evaluated in comparison to untreated control platelets. Control PCs were stored for the same time period. PCs in storage medium SSP+ (containing saline, citrate, acetate, phosphate, magnesium and potassium, identical to PAS-IIIM) were prepared from pools of 5 buffy coats. The average volume was 350 mL and the plasma concentration was approx. 35%. PCs were transferred into irradiation bags (Fig.2) for UVC treatment. After insertion into the irradiation device (Fig.3) PCs were treated with UVC light at a dose of 0.4 J/cm^2 (approx. 60 sec). They were strongly agitated during irradiation. The system was microprocessor-controlled. The control unit enables monitoring and recording of relevant treatment parameters like UV dose, UV intensity, temperature and irradiation time.

Figure 2: Twin-bag kit

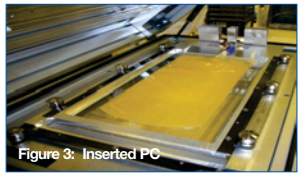

Figure 3: Inserted PC

RESULTS

Until day 8 of storage in vitro characteristics were only marginally influenced by the THERAFLEX process. Platelet activation was evaluated by measurement of the hypotonic shock response (HSR) and the expression of the activation marker CD62p. HSR was only slightly and CD62p levels were moderately affected by Theraflex treatment. Annexin V binding percentage, as a marker for apoptosis, remained almost unchanged. Glucose consumption and lactate formation were found to be marginally higher in the treated PCs. pH remained above 7.0 until day 8 after donation (Tab. 1).

Day 6*	Plts [x10^9/mL]	HSR [%]	pH	CD62 [%]	Annexin V [%]	Glucose [mg/dL]	Lactate [mmol/L]
Control	9.2 ± 1.1	71 ± 5	7.29 ± 0.04	21 ± 6	5 ± 1	62 ± 17	10.2 ± 2.3
Treated	8.5 ± 0.9	68 ± 4	7.22 ± 0.05	32 ± 5	9 ± 4	52 ± 21	10.8 ± 1.6
Day 7*							
Control	8.9 ± 0.8	72 ± 3	7.32 ± 0.05	24 ± 6	7 ± 1	55 ± 19	10.4 ± 1.6
Treated	8.4 ± 0.9	68 ± 3	7.22 ± 0.06	42 ± 13	10 ± 3	42 ± 20	11.8 ± 1.7
Day 8*							
Control	9.4 ± 1.6	71 ± 5	7.34 ± 0.06	30 ± 3	8 ± 4	45 ± 18	11.5 ± 1.6
Treated	9.1 ± 1.3	65 ± 5	7.22 ± 0.09	52 ± 12	10 ± 3	31 ± 17	13.1 ± 1.7

Table 1: In vitro parameters of untreated and treated PCs on day 6, 7 and 8 after blood donation (N=6, mean ± SD) *after blood donation

CONCLUSIONS

THERAFLEX treatment with 0.4 J/cm^2 UVC light has only a minor influence on in vitro parameters of PCs and on their storage stability until day 8 after blood donation.

Funded by Forschungsgemeinschaft der Blutspendedienste des Deutschen Roten Kreuzes e.V. and Maco Pharma.