TERUMO BLOOD AND CELL TECHNOLOGIES

Unlocking Potential

Prospective Assessment of Occupational Noise Comparing Semi-Automated and Fully Automated Whole Blood Processing Systems in a Colombian Blood Bank Center

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Introduction

There has been an increase of the quantity of studies conducted by healthcare institutions to optimize medical practices at economic, clinical, and operational levels.[1,2]

Although the incidence of hearing loss caused by occupational and environmental noise has declined, it remains an important public health issue.[3,4]

Continuous occupational noise exposure during standard eight-hour work shifts should not exceed 85 decibels (dB).[5]

The most widely used whole blood processing systems are either semi-automated (SA) systems, which require a minimum of four separate devices, or fully automated (FA) systems, which use a single processing device.[6]

SA requires an initial centrifugation to obtain a red blood cell concentrate (RBCC), a plasma unit (PU), and a buffy coat concentrate (BC), followed by a second centrifugation to produce a platelet concentrate (PC) from the previous BC.

In contrast, FA performs a single integrated processing cycle to obtain an RBCC, a PU, and a PC.[6]

Objectives

The aim of this occupational noise study is to measure and compare noise levels generated by semi-automated (SA) versus fully automated (FA) whole blood processing systems while maintaining the same operators, protocols, and operational workflow at the Hospital Pablo Tobón Uribe Blood Bank Center.

Materials and methods

Occupational noise levels were recorded every minute with the sound level analyzer SL-5868-P during 11 complete whole blood processing cycles for each SA and FA system, each yielding three blood components: RBCC, PU, and PC.

SA measurements covered pre-load, start, braking, stop, and post-load stages of two centrifugations, performed with the Presvac DP-2065-R+ centrifuge, required for one cycle.

FA measurements covered pre-load, processing, and post-load stages of one centrifugation, performed with the Reveos™ Automated Blood Processing System (Reveos) from Terumo Blood and Cell Technologies, required for one cycle.

Results

720 measurements were obtained in total.

SA (first centrifugation): 291 measurements with the following segments:
68 ≤ 65 dB; 171 = 65 to 80 dB; 42 = 80 to 85 dB; 10 ≥ 85 dB. Noise range: 60.4 to 89.3 dB.
Noise average: 71.54 ± 7.19 dB. Average duration: 27 ± 1.2 min.

SA (second centrifugation): 187 measurements with the following segments:
112 ≤ 65 dB; 75 = 65 to 80 dB; 0 ≥ 80 dB. Noise range: 52.2 to 78.8 dB.
Noise average: 64.93 ± 3.77 dB. Average duration: 17 ± 1.8 min.

FA: 242 measurements with the following segments:
106 ≤ 65 dB; 134 = 65 to 80 dB; 2 = 80 to 85 dB; 0 ≥ 85 dB. Noise range: 59.1 to 82.4 dB.
Noise average: 66.37 ± 3.61 dB. Average duration: 22 ± 0.5 min.

Noise peaks exceeding 85dB were recorded only with the SA system.

Table 1 summarizes the results.

Table 1. Occupational noise measurements during centrifugation processes, including parameters' total count, average and standard deviation, from SA versus FA.

	Semi-Automated System		Fully Automated System
Parameters	**First centrifugation**	**Second centrifugation**	**Single process**
Total noise measurements	291	187	242
Noise measurements ≤ 65 dB	68	112	106
Noise measurements 65 to 80 dB	171	75	134
Noise measurements 80 to 85 dB	42	0	2
Noise measurements ≥ 85 dB	10	0	0
Minimum decibels (dB)	60	52	59
Maximum decibels (dB)	89	79	82
Average decibels (dB) ± SD	72	65	66
Decibel standard variation	± 7.2	± 3.8	± 3.6
Average duration (minutes)	27	17	22
Duration standard variation	± 1.2	± 1.8	± 0.5

Conclusions

The FA system with the Reveos™ from Terumo Blood and Cell Technologies produced lower noise levels and shorter processing times than the SA system with the Presvac DP-2065-R+ centrifuge.
Sound peaks above the 85 dB noise occupational limit occurred only with the SA system, reaching a maximum of 89.3 dB.
FA workflow was, on average, quieter and faster, while maintaining the same yield of blood components (RBCC, PU, PC).
The results from this study favor the FA system over the SA system.
The authors consider the FA system the preferred option for whole blood processing in Hospital Pablo Tobón Uribe Blood Bank Center.

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