

Comparison of Quality Parameters from Control Units Processed with Semi-Automated and Automated Processing Systems in the Colombian Blood Bank Center Hospital Pablo Tobón Uribe

Nil Comasòlivas, MSc, MD¹; Gloria Eugenia Barco Atehortúa, BSc²; Angela Estrada Naranjo, BSc²; Sergio Jaramillo Velásquez, MD²

¹Terumo Blood and Cell Technologies Europe NV, Zaventem, Belgium. ²Hospital Pablo Tobón Uribe Blood Bank Center, Medellín, Colombia

Introduction

Blood bank centers have increased in recent years their focus on assessing their product quality parameters and operational procedures. Understanding which processes and systems can yield better blood-related product outcomes is a requirement to optimize standardization, productivity, and product quality. In blood bank centers, whole blood processing can be performed using an automated system that requires a single device; or using a semi-automated system that requires multiple devices.^{[1][2][3][4]}

Objectives

The aim of this study is to assess and compare blood quality parameters from control units processed using a semi-automated, buffy coat method from January to December 2020, versus the units processed using an automated method from June 2021 to July 2022. All processes were performed in Hospital Pablo Tobón Uribe Blood Bank Center (HPTUBB), located in Medellín, Colombia.

Methods

We performed a retrospective analysis of control units from Red Cell Concentrates (RCC), Platelet Units (PU) and Plasma Concentrates (PC) processed in HPTUBB. The inclusion criteria for these 3 control units was that they had to be obtained using a semi-automated or automated method from a single whole blood bag.

In HPTUBB, between 1st January 2020 to 31st December 2020, the semi-automated, buffy coat method was used to process whole blood units. The medical devices used for this method were a separator T-ACE® from Terumo BCT and a refrigerated floor centrifuge DP-2065 R Plus from Presvac. From this timeframe, 115 control units were included in this assessment. These units were the ones processed with the Terumo BCT Imuflex® Blood Bag, also known as a quadruple bag, as this was the only bag used in the center that could obtain the three different final units. The quantities were: 19 RCC, 48 PU, and 48 PC.

Between 1st June 2021 to 31st July 2022, the Reveos® Automated Blood Processing System, a fully automated method, was used to process whole blood units. 181 control units were included in this assessment. These units were the ones processed with the Terumo BCT Reveos® Blood Bag, that produces the three different final units. The quantities were: 55 RCC, 69 PU, and 57 PC.

In total, 10 different parameters from the control units were included in the analysis. From each one of them, average and standard deviation were performed. In addition, using the values of these parameters, a comparison between both processing methods was performed.

A comparison table (Table 1) was developed to portray the different parameters and results.

Results

RCC processed with the Reveos® Automated Blood Processing System had +16.16% higher volume levels compared to the semi-automated system while maintaining almost the same level of hematocrit (-0.64%). PU processed with the Reveos® Automated Blood Processing System decreased -2.42% their volume levels compared to the semi-automated system. However, despite having lower volume levels, they had +6.10% higher absolute platelet count and a -28.19% standard deviation reduction on this parameter. Regarding leucocytes, they had a slightly increase (+1.91%) compared to semi-automation, although the standard deviation on this parameter was substantially lower (-19.43%). PC processed with the Reveos® Automated Blood Processing System had +18.34% higher volume levels compared to the semi-automated system. Furthermore, they decreased the absolute platelet count by -10.49%.

		Semi-automated		Automated	
Product	Parameters	Average	Standard Deviation	Average	Standard Deviation
Red Cell Concentrates (RCC)					
	Volume (mL)	246.26	11.29	286.04	17.62
	Hematocrit (%)	60.14	3.48	59.75	1.95
Platelet Units (PU)					
	Volume (mL)	50.26	4.99	49.05	5.96
	Absolute platelet count	1.32E+03	208.43	1.40E+03	149.67
	Platelet count* (Quantity/unit)	6.64E+10	1.19E+10	6.89E+10	1.16E+10
	Leucocytes (Quantity/unit)	1.39E+04	1.14E+04	1.42E+04	9.16E+03
	pH	7.18	0.14	7.08	0.21
Plasma Concentrates (PC)					
	Volume (mL)	213.81	15.98	253.02	34.01
	Absolute platelet count	4.43E+04	5.20E+04	3.96E+04	3.23E+04
	Platelet count* (Quantity/unit)	9.33E+06	1.02E+07	1.02E+07	8.95E+06

*Platelet count = Absolute platelet count × Volume × 10⁶

Table 1. Parameters' average and standard deviation from each product unit processed using the semi-automated, buffy coat method (January 2020 to December 2020), or using the fully automated method (June 2021 to July 2022).

Conclusions

Control units processed in Hospital Pablo Tobón Uribe Blood Bank with the Reveos® Automated Blood Processing System, a fully automated method, with the Terumo Reveos® Blood Bag, had, overall, higher product quality parameters, such as volume levels and platelet count, compared to the control units processed with the semi-automated, buffy coat system using the Terumo BCT Imuflex® Blood Bag.

Therefore, the usage of the fully automated method for whole blood processing should be the preferred option to standardize and optimize product quality parameters and continue complying with local and international guidelines and regulations.

The authors encourage other blood bank and healthcare centers to perform additional assessments on the differences between whole blood processing systems to increase the scientific knowledge, share best practices, and raise awareness on new, innovative, processing technologies.

Importance of research

This is one of the first research studies performed in Colombia that compares blood quality parameters of the final product units processed with two different processing systems (semi-automated and automated) in the same blood bank center. This is the key factor that help avoiding comparison biases related to multi-centric assessments such as different donor populations, geographic locations (e.g. effect of altitude in hematocrit), operator training and expertise and education, operational peculiarities, etc.

References

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