

Platelet-poor Plasma at the Point of Collection Using the Torq™ Zero Delay Centrifuge System

SUMMARY

Platelet-poor plasma (PPP) – blood plasma with platelet counts of $<10 \times 10^3$ PLT/ μ L – is required for various diagnostic applications including routine coagulation testing, plasma electrolyte measurements, and nucleic acid-based assays¹⁻⁴. It is generally required that specimens be processed within 1 hour and no longer than 24 hours⁴. The Torq zero delay centrifugation system can achieve PPP at the point of collection.

BACKGROUND

Sandstone’s Torq zero delay centrifuge system goes beyond current blood separation systems in offering superior plasma purity and stability, true portability, and separation speed, eliminating dependence on bulky laboratory centrifuges. The Torq system comprises the battery powered Torq ZDrive™, a small, lightweight centrifuge, and the Torq ZDisc™, an evacuated, 4.0 mL sterile disc containing lithium heparin for anticoagulation. The Torq system is intended for use in both existing and novel blood draw workflows to improve the quality, access, and reliability of plasma-based blood analyses.

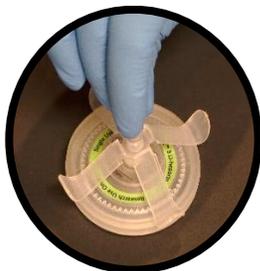


The Torq ZDrive



The Torq ZDisc

To use the Torq system, the operator uses a butterfly needle and a specially engineered safety device to draw blood directly into the ZDisc, places the ZDisc into the ZDrive, and closes the lid. The ZDrive spins automatically, reaching G-forces of 2,000-3,000g, comparable to a laboratory centrifuge. The fully automated ZDrive requires no timers or calibrations:



Load ZDisc with blood from direct draw



Spin in ZDrive for about 4 minutes



Extract plasma from ZDisc for shipment or testing

METHODOLOGY

Whole blood was collected from 3 healthy human donors into commercially available sodium citrate tubes. The first sodium citrate tube from each donor was separated using conventional laboratory methods for PPP preparation – 15-minute centrifugation at 2500 g – and whole blood from the second sodium citrate tube was transferred to the ZDiscs for centrifugation using the ZDrive – 4 minutes at 2100g (10,000 RPM). A third sodium citrate tube from each donor was used as a control for normal platelet count. Plasma platelets from each condition were counted using the Rees-Ecker method. Platelet levels from each donor were measured in triplicate for each condition and are shown in figure 1.

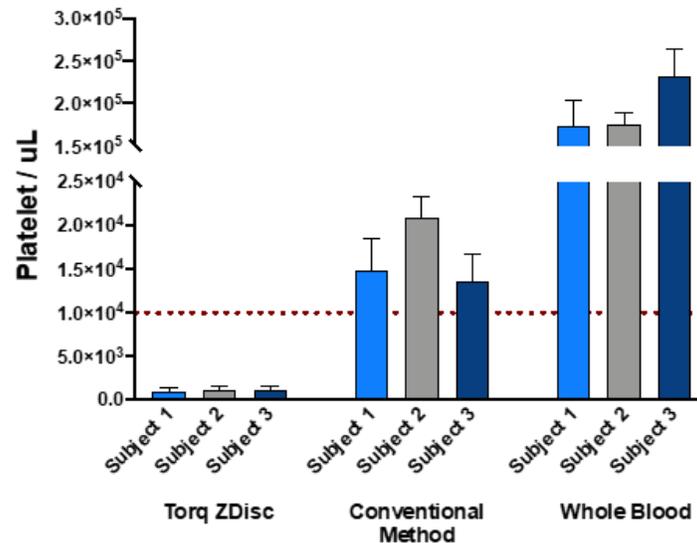


Figure 1. Platelet concentration of plasma (PLT/uL) prepared using the Torq ZDisc and conventional method, with total platelet count of each subject in whole blood. The red dotted line indicates the platelet threshold of PPP.

In a second study, blood was collected from 35 Greyhound subjects in Torq ZDiscs with EDTA and separated using the ZDrive. PPP was obtained and used for the testing of osteosarcoma markers. In order to validate the use of the Torq system to produce PPP, blood samples were collected from one Greyhound in two EDTA Vacutainer® tubes and four ZDiscs. The blood from one Vacutainer was left as a whole blood control and the second one was separated on a conventional centrifuge. Two ZDiscs were separated using standard ZDrive spin parameters (~4 minutes) and two ZDiscs were separated using an extended ZDrive spin setting (~8 minutes). After separation, residual platelets in the plasma were counted using an IDEXX ProCyte Dx hematology analyzer. Results are summarized in Table 1. Values marked with an * had platelet concentrations below the limit of detection (instrument linearity 0-2000 K/ μ L, R \geq 0.95⁵).

Collection Method	Centrifugation Method	Platelet Count/ μ L
Vacutainer	No centrifugation	175000
Vacutainer	Conventional centrifuge	25000
ZDisc	ZDrive (~4 min)	2000
ZDisc	ZDrive (~4 min)	9000
ZDisc	ZDrive (~8 min)	4000
ZDisc	ZDrive (~8 min)	0*

Table 1. Blood collection method, centrifugation method, and measured platelet

CONCLUSIONS

Both studies completed indicate the Torq zero delay centrifugation system is a reliable way to obtain platelet poor plasma at the point of collection in both human and Greyhound subjects. Traditionally, PPP preparation requires the use of large laboratory equipment that requires training, a significant power source, and at least 15 minutes of preparation time.⁴ With a 4-minute, 2,100g separation, and use of 2 AA batteries, the Torq System generates plasma samples with platelet levels far below the PPP threshold. Given its small, portable footprint and rapid separation capabilities, the Torq System can bring PPP preparation to every application for which it is needed.

REFERENCES

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