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ROTEA: A CLOSED AND AUTOMATED INSTRUMENT FOR EFFICIENT CELL ISOLATION, WASHING AND CONENTRATION IN CELL THERAPY WORKFLOWS

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INTRODUCTION

Processing and manufacturing cell and gene therapy products is of vital importance to patients and has presented numerous challenges. Rotea's closed system counterflow centrifugation technology enables gentle cell isolation, and wash and concentrate, and can be easily automated and programmed to serve many additional workflows. Together the single use kit and instrument are able to capture and sustain billions of cells in a stable, fluidized bed with flexible inputs up to 20 liters and output volumes as low as 5 mL.

We set out to evaluate Rotea's ability to isolate PBMCs from leukopaks, and wash and concentrate T cells, two common and vital processes in cell therapy workflows. We also investigated the input and output capabilities of the instrument.

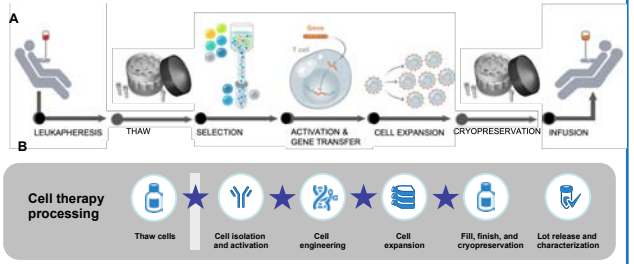

Figure 1. Current cell therapy workflow. (A) Current processes rely heavily on cell isolation, wash, and concentrate. Automated processing in each step indicated in (B) can increase the efficiency and lower the cost of cell therapy manufacturing.

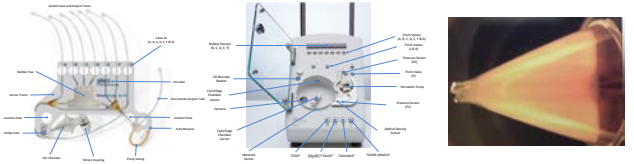

Figure 2. The Rotea system which includes the single use kit, instrument and accompanying software, provides closed and automated cell processing solutions by collecting cells of interest in a fluidized cell bed.

Key Features:

- **Scalable throughput**- continuous processing of up to 20L
- **Small minimum output volume**- As low as 5 mL
- **Flexible**- programmable, multiple processing modes including cell separation, concentration and washing. The system can easily be adapted by the user to new workflows.
- **Universal kit** (consumable) for different cell types and applications
- **Small bench top footprint**

RESULTS

PBMC Isolation Using Rotea

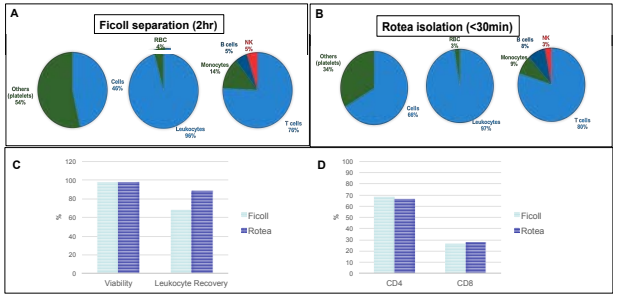

Figure 3. Rotea provides high quality, efficient PBMC isolation, comparable to manual Ficoll separation, but in significantly less time. (A and B) Rotea completes PBMC isolation in 30 minutes with thorough platelet and RBC depletion. (C and D) The viability, recovery and T cell composition from Rotea PBMC isolation are equivalent or better than Ficoll separation.

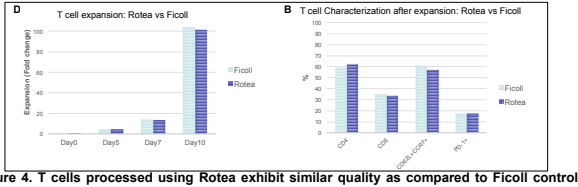

Figure 4. T cells processed using Rotea exhibit similar quality as compared to Ficoll control throughout expansion. (A) The expansion rate of T cells after Rotea and Ficoll processing remain very similar throughout a 10 day expansion. (B) T cell composition, differentiation and exhaustion status are similar between Rotea and Ficoll samples after expansion.

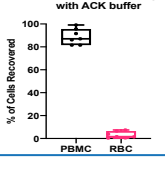

Figure 5. PBMC Isolations from 7 different Donors using ACK Buffer for RBC Lysis have high recovery and low RBC contamination. The average PBMC recovery across 7 donors was ~90%. After Isolation and RBC lysis, on average less than 5% of the starting population of RBCs remained.

T Cell Wash and Concentrate Using Rotea

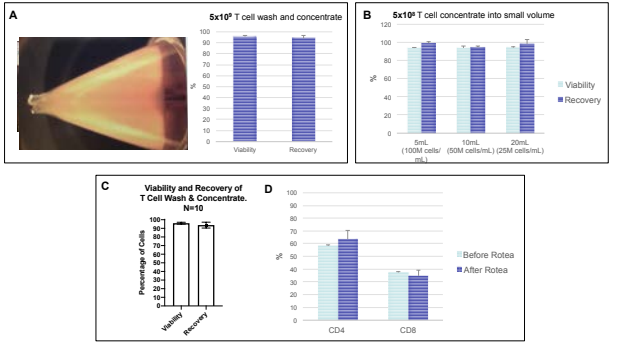

Figure 6. Rotea T cell wash and concentrate with controllable input and output. (A) Rotea chamber (left) accommodates more than $5x10^9$ T cells and maintains high viability and recovery after wash (right). (B) Rotea precisely controls output volumes as low as 5mL, and can provide concentrations as high as $1x10^8$ cell/mL in the output collection. (C) T cell recovery and viability over 10 runs of T Cell wash and concentrate, both recovery and viability averaged over 90% with low variability (D) T Cell composition is not altered after Rotea wash and concentrate.

CONCLUSIONS

- Rotea provides highly efficient PBMC isolation across many donors with high recovery and cell quality. It can isolate PBMCs much faster than manual methods while maintaining equivalent or improved quality and cell health.
- Rotea provides gentle and efficient cell wash and concentrate with >90% recovery of T cells, and maintenance of viability with flexible input and output volume.
- Due to it's high level of flexibility and programmability, Rotea is capable of facilitating the whole cell therapy workflow from PBMC isolation all the way to cryopreservation.

TRADEMARKS/LICENSING