

Advancing Flow Cytometry Diagnostics: The Curiox C-FREE™ Pluto System in Clinical Laboratory Automation

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The Curiox C-FREE™ Pluto system revolutionizes clinical flow cytometry by automating workflows, reducing hands-on operator time, and safety. This automated system achieves comparable population frequencies and cell retention to traditional methods while improving debris removal, making it a reliable solution for high-throughput immunological diagnostics.

Introduction

Flow cytometry is a cornerstone of immunological diagnostics, providing precise insights into immune system health. However, modern clinical workflows face challenges related to efficiency, reproducibility, and operator fatigue due to high throughput demands. This poster presents the Curiox C-FREE™ Pluto system (Pluto system) as a revolutionary solution addressing these challenges through automation and advanced features.

Key Features of the Pluto System:

- **Non-Disruptive Sample Handling:** Ensures integrity of cell populations.
- **Transferable Protocols:** Simplifies implementation across laboratories.
- **Enhanced Safety:** Eliminates aerosol generation and cross-contamination risks.
- **Integrated Antibody Cocktailing:** Minimizes errors and ensures consistent staining.

Methodology

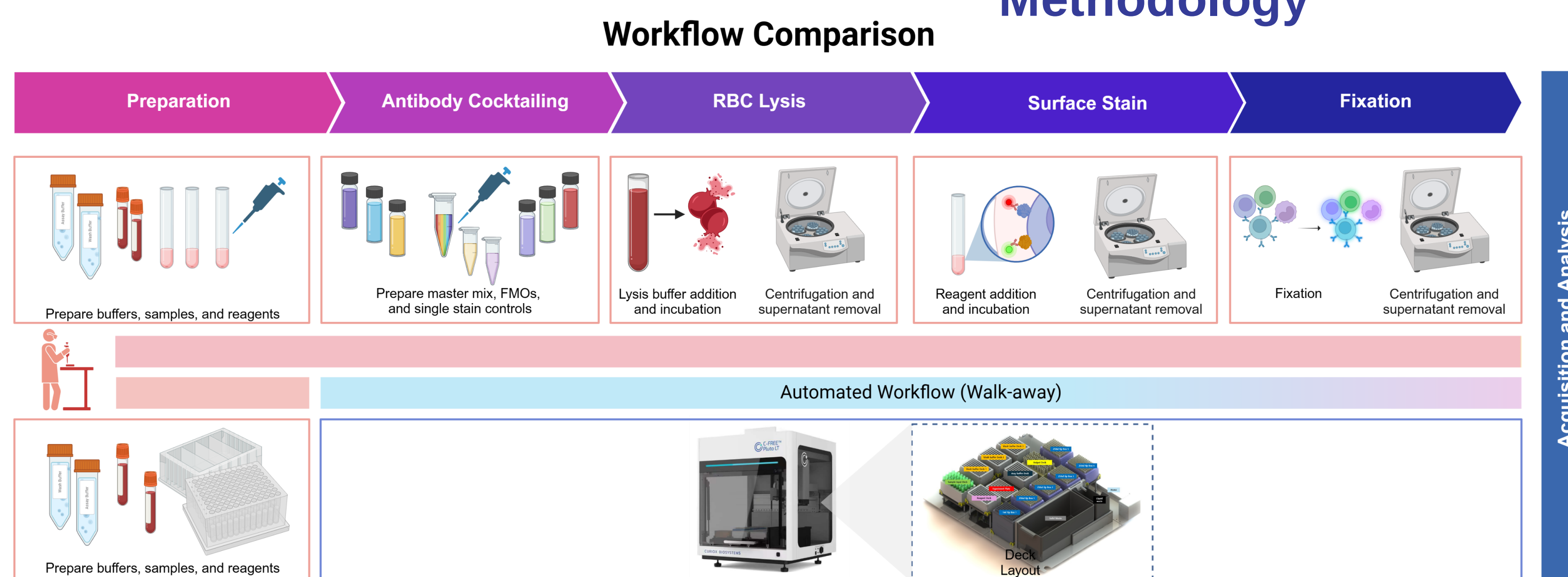


Table 1: Comparison of workflow time*

Method	Conventional	Pluto System
Hands-on (min)	88	0
Walk-away (min)	50	172
Total time (min)	138	172

*Excludes time taken for antibody cocktailing.

Table 2: Immunophenotyping Panel

Fluorochrome	Markers
BV421	CD20
BV711	CD5
BV510	CD3
BV786	CD45
BV605	CD10
FITC	CD79b
PerCP-Cy5.5	CD27
PE	polycl-LAM
PE-CF594	IgM
PE-Cy5	CD14
PE-Cy7	CD19
APC-R700	CD38
APC-H7	CD24

Figure 1: Comparison of sample preparation workflows by conventional and Pluto System. The schematic diagram presents a side-by-side comparison of the operator's hands-on time (Table 1) for material preparation, antibody cocktailing (Table 2), and sample preparation steps for flow cytometry acquisition and analysis. The Pluto system streamlines these processes through end-to-end automation, where the operator simply loads labware and reagents onto the deck.

Results

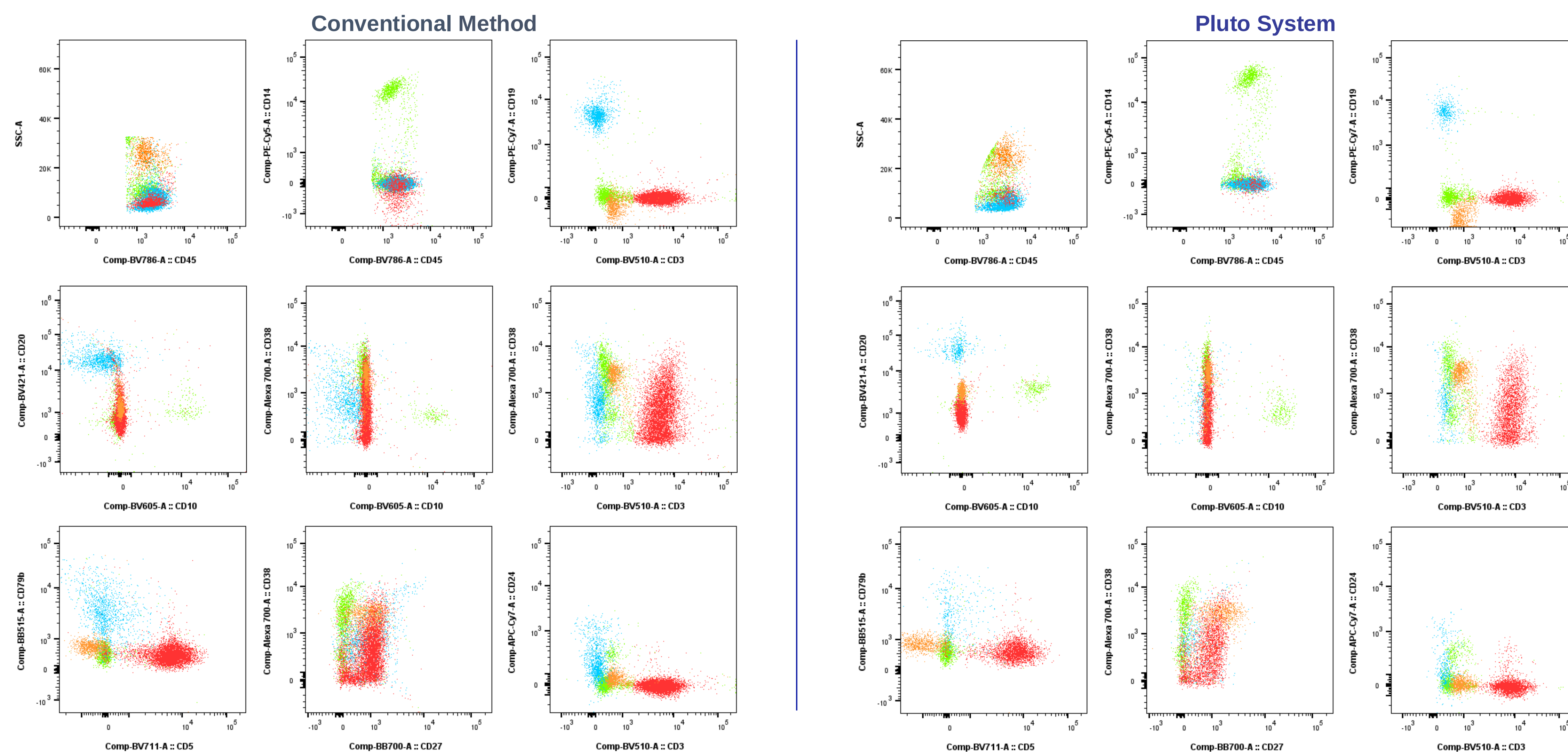


Figure 2: Representative Dot Plots of Immune Populations. Peripheral blood from a healthy donor was processed and surface-stained for immunophenotyping using the conventional method or the Pluto system. The comparable population resolutions between methods demonstrate the efficiency of the automated system in sample preparation while maintaining consistent staining quality and effective background removal. Samples were acquired using a BD Symphony flow cytometer and analyzed with FlowJo v10.10. Immune populations are represented as follows: CD45⁺ cells (green), T cells (red), CD19⁺ B cells (blue), and CD14⁺ monocytes (orange).

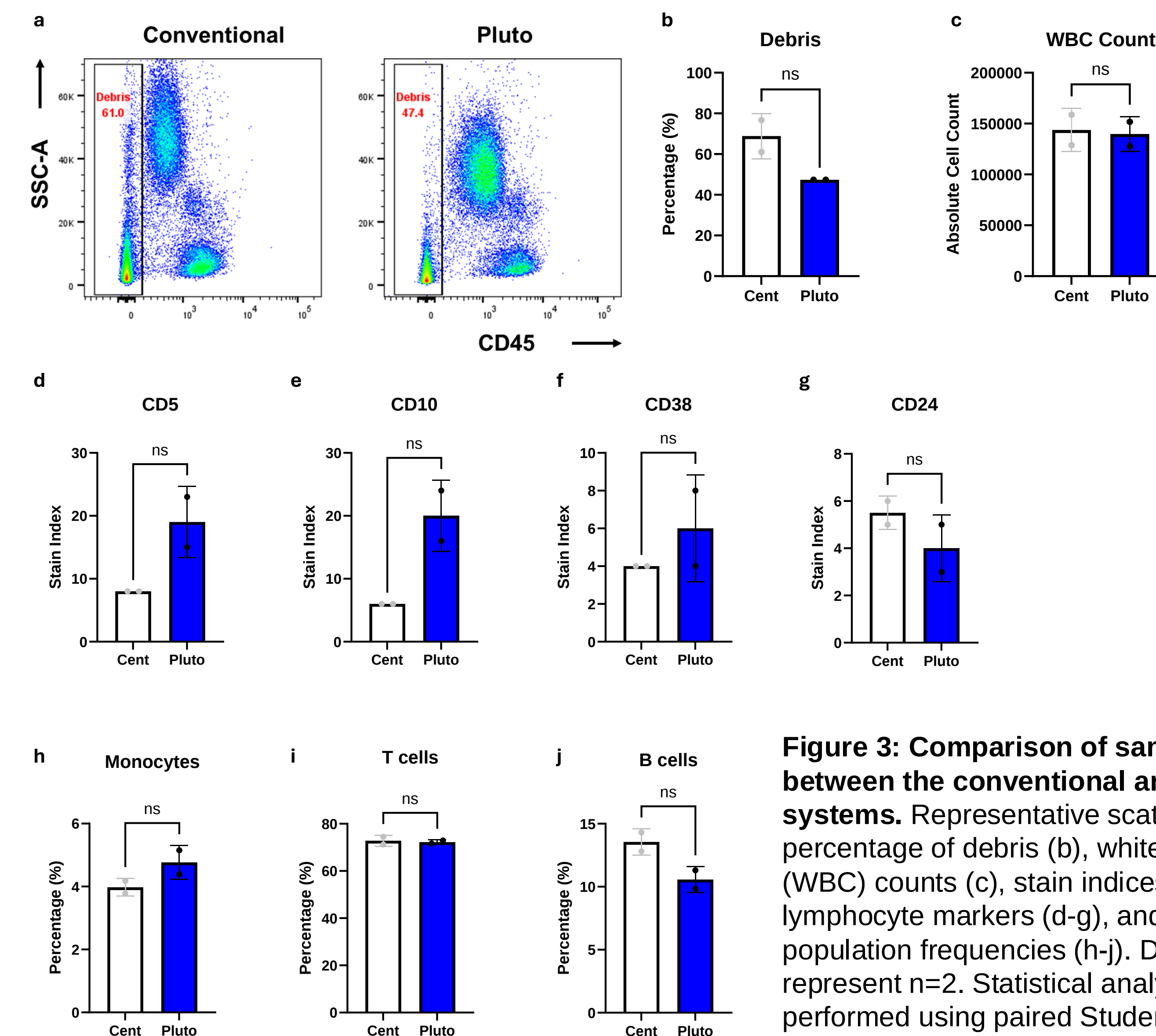


Figure 3: Comparison of sample quality between the conventional and Pluto systems. Representative scatterplots (a), percentage of debris (b), white blood cell (WBC) counts (c), stain indices of lymphocyte markers (d-g), and lymphocyte population frequencies (h-j). Data represent n=2. Statistical analysis was performed using paired Student's t-test.

Conclusion

The Curiox C-FREE™ Pluto System enhances clinical flow cytometry by addressing key challenges of modern diagnostics.

- **Efficiency:** Reduces operator time and fatigue.
- **Reproducibility:** Ensures consistent results across workflows.
- **Safety:** Improves laboratory safety standards.

These advancements support high-throughput diagnostics with precision, reliability, and improved data quality, marking a paradigm shift in clinical laboratory automation.

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