RESEARCH SNAPSHOT

GO WITH THE FLOW: Faster, Unbiased, Painless Sorting–Enabled by the LeviCell System

Overview

Dead cells and debris, which block efficient and gentle processing of sensitive cell types, are a challenge that often hinders cell sorting. Sample quality and sensitivity challenge the flow process, and researchers can face a dilemma between speed vs. cell stress. Higher pressure creates faster results but can also be less accurate and more damaging to fragile and sensitive cells. The advanced LeviCell® 1.0 system resolves this issue by quickly removing dead cells and debris upfront without biasing the proportions of cell populations. The result is enriched samples that enable flow cytometry with slower speeds and lower pressures, which preserve cell health and gently sort fragile cells while maximizing the throughput of meaningful events.

Under pressure: Cell Sorting Tradeoffs Between Speed And Cell Stress

Cells are sorted based on their physical and biochemical characteristics. Achieving the perfect balance between maximizing speed and minimizing cell stress is crucial for optimal performance.

- Faster sorting speeds can increase throughput but may also lower sorting efficiency and cell viability due to the stress and damage caused to cells by higher shear forces.
- Higher pressures enable faster sorting but may lead to fluidic system clogging and reduced cell viability.

Common Challenges of Processing DTCs with Flow Cytometry

Dissociated tumor cells (DTCs) are suspensions of cells separated from solid tumor tissues that are valuable for cancer biology research. Flow cytometry is a great way to characterize DTCs or isolate specific cell populations for downstream analyses; however, sample collection, storage, and processing realities mean that most DTCs go through inherently damaging tissue dissociation and cryopreservation steps, hampering flow analysis in the following ways:

- Preparing DTC samples for flow cytometry typically results in a loss of yield.
- Samples often have a significant level of cellular debris, which complicates their efficient examination via cell sorting.
- Using high speed pressure to ensure adequate throughput of viable cells of interest during cell sorting adds mechanical stress, risking the loss of valuable cells altogether due to artificial cell death.

Viable, Unbiased Cell Enrichment and Debris Removal Using the LeviCell System

Despite the challenges, you can optimize the throughput of meaningful flow events by starting with higher-quality enriched samples free of the “noise” of dead cells and debris. Enriched samples allow for gentler cell sorting with lower pressures, permitting greater throughput without wasting time analyzing the junk and enabling faster processing without sacrificing cell health.

KEY HIGHLIGHTS

10X faster and gentler cell processing–Only with LeviCell

- Boost viable cell count by 3x and reduce dead cells and debris by 5x in just 20 minutes
- Generate purer starting samples for high-accuracy flow cytometry with lower pressures and no dyes or antibodies
- Preserve cell populations without bias

The advanced LeviCell® 1.0 system enhances the quality of valuable DTC samples by using Levitation Technology to enrich the most viable cells while effectively removing both small and large debris and dead cells from the suspension (Figure 1). This innovative approach offers two key advantages:

1. Enriched viable samples lead to more meaningful events. Viability allows for increased confidence in the analysis and gating strategy.
2. Samples with higher viable cell percentages enable lower pressures, allowing fragile cells to withstand the mechanical stresses of flow cytometry better.

Face Flow Cytometry with Confidence Using LeviCell

- **Viable cell enrichment by up to 3x and removal of debris and dead cells by 5x in preparation for flow cytometry**
- More meaningful events and enhanced confidence in the flow-gating strategy
- Lower pressure preserves fragile cell integrity
- Original population representation preserved in samples without bias

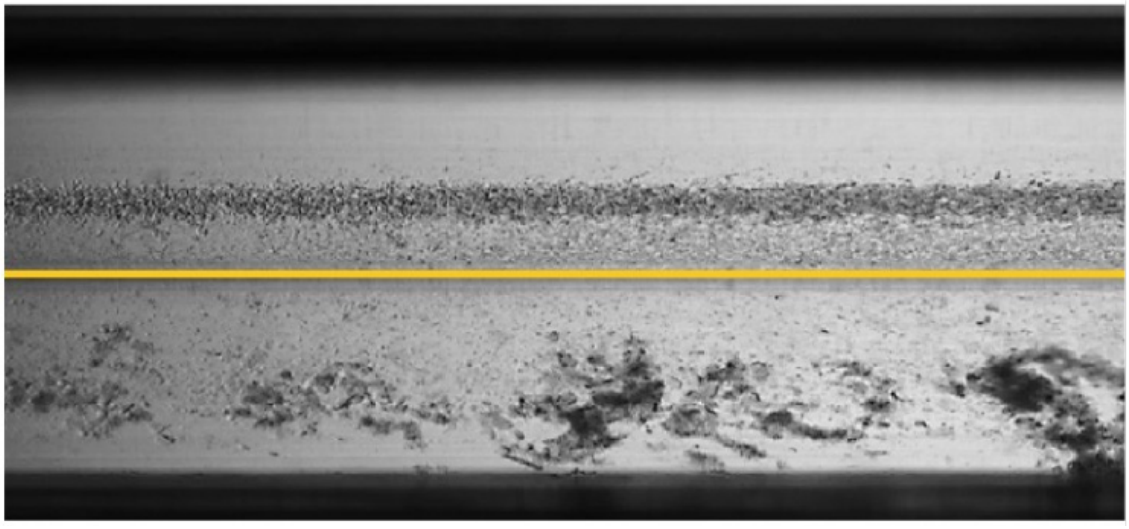

Figure 1. Viable cell enrichment with the LeviCell 1.0 system. *Viable cells levitate above the split line (midpoint between the magnets), dead cells are immediately below the split line, and debris is observed as larger objects and clumps near the bottom of the levitation chamber.*

As seen in Figure 2, a human lung DTC sample was characterized before and after levitation to enrich viable cells and remove dead cells and debris with the LeviCell 1.0 system. Post-levitation, viable cell enrichment in the DTC suspension increased by approximately 3-fold while the dead cell proportion dropped by over 5-fold.

Preserving the integrity of the original cell populations is essential for accurate downstream analyses. The LeviCell 1.0 system maintains sample population representation without bias (Figure 3), empowering researchers to enrich samples confidently before flow cytometry.

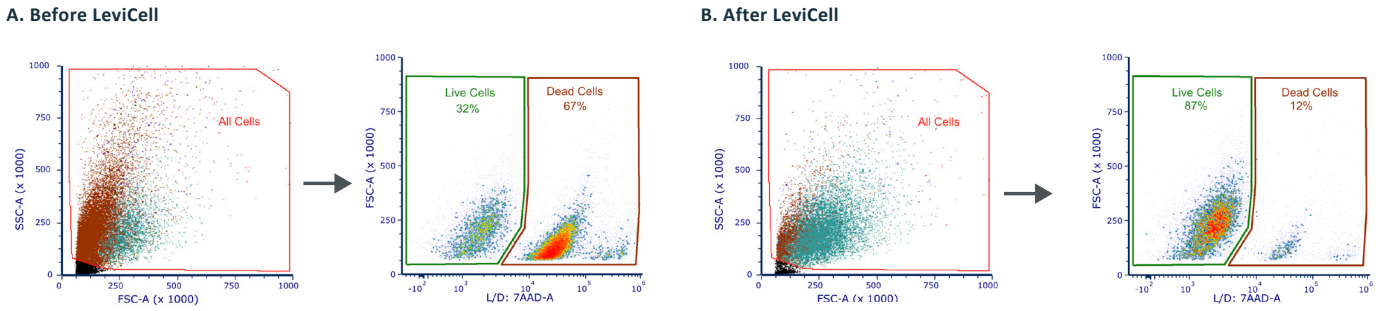

Figure 2. Flow cytometry analysis of a human lung DTC sample before (A) and after (B) viable cell enrichment using the LeviCell 1.0 system. *7-Aminoactinomycin D (7AAD) was used to distinguish between intact dead cells (7AADPos) and viable cells (7AADNeg). After levitation, live cell events increased from 32% to 87% (B). This increase corresponded with the removal of dead cells, which decreased from 67% to 12%.*

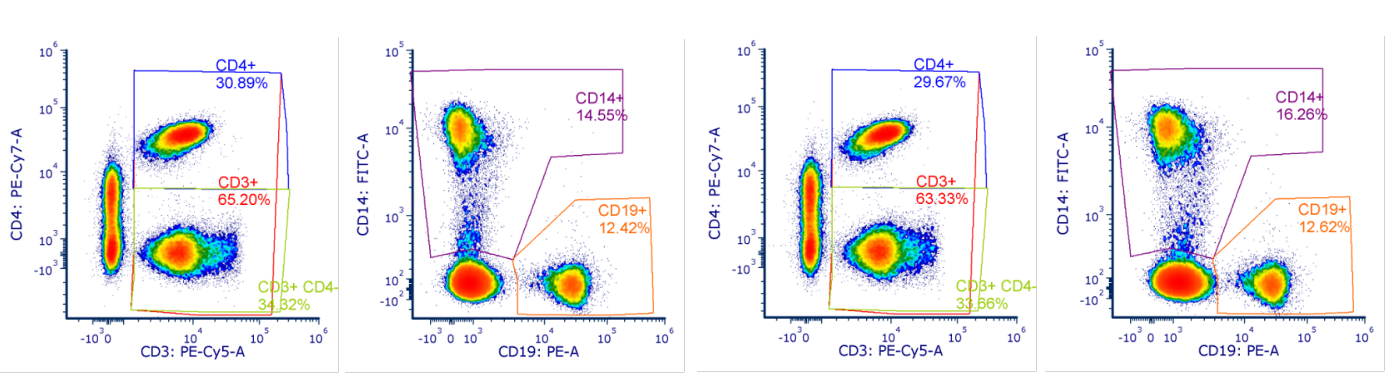

Figure 3. Flow cytometry analysis of human PBMC samples before (A) and after (B) viable cell enrichment using the LeviCell system. *Before levitation, samples were stained with anti-CD3 and anti-CD4 (left) or anti-CD14 and anti-CD19 (right). After running on the LeviCell 1.0 system, cell populations show no distinguishable differences in proportions of CD3+ CD4+ and CD3+ CD4- cells or in proportions of CD14+ and CD19+ cells, compared to before levitation.*

Conclusion

The LeviCell platform's groundbreaking magnetic Levitation Technology significantly improves cell sorting analysis of DTCs from a wide range of cancer types by quickly generating purer and unbiased viable DTC populations. Such high-quality enriched samples enable more efficient flow cytometry with lower pressure, ensuring more accurate event detection and better survival of sensitive cell types. With the LeviCell platform, researchers can unlock new insights into tumor biology and the host response, propelling research in the fields of personalized medicine, drug and biomarker discovery, and preclinical or translational research. Experience the LeviCell difference and revolutionize your flow cytometry workflow.

For more information, visit **levitasbio.com,** or contact **sales@levitasbio.com**.