BLOG
Automated Cell Counting

SpectraSlide® AP-1: One-Touch Innovation in Cell Counting

logos biosystems
by ALIGNED GENETICS

Introduction: Still Struggling with Cell Counting?

Every researcher has, at some point, been frustrated by the tedious process of cell counting. At first glance, it seems simple—just look under the microscope and count. But in reality, countless unexpected variables can make it far more complicated:

· Cells that are unevenly distributed or cluster in specific regions
· Clumped cells that are difficult to distinguish
· Samples that dry out too quickly due to limited volume

Any one of these issues can force you to restart the experiment from scratch. Moreover, even when analyzing the same sample, two researchers often obtain inconsistent results. These small discrepancies can cascade, affecting downstream experiments such as cell culture, transfection, or drug treatment studies. The widely discussed "reproducibility crisis" in modern research is closely tied to this very issue. Inaccurate cell counts can distort experimental baselines and compromise data integrity from the very start.

· Too few cells may lead to skewed growth curves or viability analyses.
· Too many can alter drug response profiles or produce misleading results.

Manual counting is also physically and mentally draining. After processing dozens of samples per day using a hemocytometer, researchers often suffer from eye strain, wrist fatigue, and concentration loss—any of which can introduce serious counting errors. And when working with precious materials, such as patient-derived samples or costly cell lines, a single mistake can mean the loss of thousands of dollars' worth of research resources.

SpectraSlide® AP-1 – One-Touch Innovation in Cell Counting

To address these long-standing challenges in cell counting, SpectraSlide® AP-1 was developed as a truly streamlined solution. This innovative slide simplifies the traditionally tedious and error-prone counting process into a single, effortless motion. By eliminating the need for manual dye mixing and pipetting, the SpectraSlide® AP-1 allows users to stain and load cells simultaneously — all in one step. This design not only enhances accuracy and efficiency, but also ensures superior reproducibility across experiments.

Figure 1 : *SpectraSlide® AP-1 – Simplifying the cell counting workflow through one-touch innovation..*

AO/PI Pre-Coating + Room Temperature Stability – Always Ready-to-Use Slide

One of the key innovations of SpectraSlide® AP-1 lies in its surface, where the fluorescent dyes AO (Acridine Orange) and PI (Propidium Iodide) are applied using a proprietary dye coating technology (Advanced Dye Coating Formulation).
This unique chemical composition ensures excellent shelf stability and rapid reactivity, allowing the dyes to dissolve instantly upon contact with a sample and clearly distinguish between live and dead cells.

· **AO** (green): Binds to the DNA of all nucleated cells, staining both live and dead cells.
· **PI** (red): Penetrates only cells with damaged membranes, selectively staining dead cells.

Thanks to this technology, researchers can skip the preparation or mixing of staining reagents — as soon as the sample is loaded onto the slide, live/dead discrimination occurs automatically. In addition, this proprietary coating eliminates common issues associated with liquid reagent storage such as degradation, contamination, and refrigeration requirements. The slides remain stable for extended periods at room temperature, maintaining consistent dye performance up to the point of use.

· No refrigeration or freezing required
· Long-term shelf stability at room temperature (enhanced shelf stability)
· Consistent staining performance maintained until use

In other words, there's no need to take reagents out of the fridge, mix them, or fine-tune pipetting volumes. Simply take out a slide and load your sample — this small difference dramatically improves the speed and reproducibility of cell counting.

Sampling Precision – Consistent Loading with Haptic Feedback Design

One of the main limitations of traditional hemocytometer-based cell counting is its dependence on the researcher's manual skill. Even with the same sample, variations in loading technique can cause uneven cell distribution, leading to inconsistent counting results.

The SpectraSlide® AP-1 eliminates this variability through a haptic feedback-based sampling mechanism. By simply pressing and releasing the built-in rubber dome, a consistent sample volume (approximately ≤ 20 µL) is automatically drawn into the internal channel.
This controlled mechanical action ensures reproducible sample loading — independent of user technique or pipetting proficiency — minimizing variability between experiments. Designed exclusively for use with the LUNA-FX7™ Automated Cell Counter, the SpectraSlide® AP-1 supports two imaging modes, allowing researchers to select conditions that best suit their experimental needs:

· **Spectra Mode**: Recommended for general cell types and routine counting
· **SpectraMax Mode**: Ideal for very small cells or samples likely to show uneven distribution, providing improved consistency

Because the slide is dipped directly into the sample, a working volume of approximately 200 – 500 µL is required. With a single loading step, researchers can analyze a broader area, enhancing both workflow efficiency and data reproducibility in cell counting.

SlideBed™ – A Contamination-Prevention Frame that Protects Your Instrument

The SpectraSlide® AP-1 was designed with more than just user convenience in mind — it also includes a thoughtful safety feature called SlideBed™, an independent protective frame. After loading the cell sample, placing the slide into the SlideBed™ prevents any residual liquid from seeping into the interior of the instrument. Functioning as a physical barrier between the slide and the LUNA-FX7™, the SlideBed™ provides several practical advantages:

· Minimizes the risk of internal contamination or liquid damage
· Extends the instrument's lifespan and operational stability
· Reduces maintenance frequency and costs, improving long-term laboratory efficiency

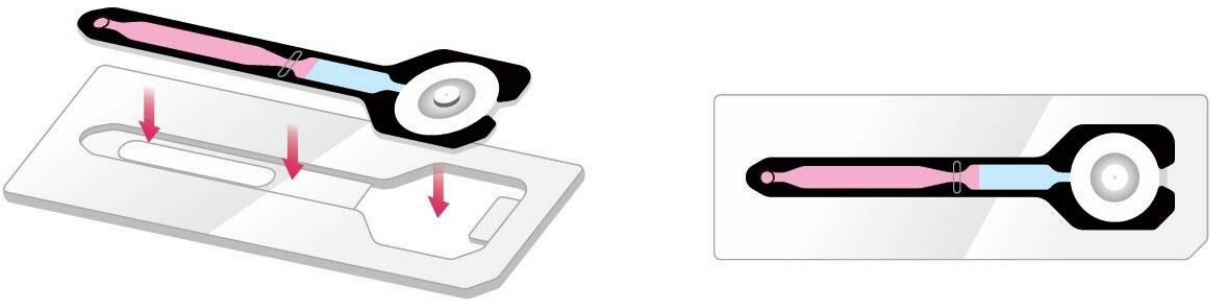

Figure 2. *SlideBed™ – Independent frame designed to prevent contamination and protect the instrument.*

Accuracy & Reliability – Proven Performance Across Diverse Cell Types

The performance of the SpectraSlide® AP-1 has been thoroughly validated across various cell types through multiple Logos Biosystems Application Notes. When used with the LUNA-FX7™ Automated Cell Counter, the SpectraSlide® AP-1 provides a streamlined workflow and consistent staining quality — delivering accuracy and reproducibility equivalent to the standard PhotonSlide™.

U937 and PBMC (Peripheral Blood Mononuclear Cells)

In comparative cell counting analyses using U937 and PBMC samples, the cell concentration and viability measurements obtained with SpectraSlide® AP-1 closely matched those of the PhotonSlide™. This indicates that SpectraSlide® AP-1 maintains the same level of reliability as the standard slide while offering a much simpler workflow.

· Concentration: R^2 = 0.9967 (U937), 0.9995 (PBMC)
· Viability: R^2 = 0.9964 (U937), 0.9993 (PBMC)

These results confirm that SpectraSlide® AP-1 delivers stable and reproducible outcomes regardless of cell type or sample characteristics.
For more details, please refer to the "U937 & PBMC Application Note."

AsPC-1 and H-1975 (Aggregated Cancer Cells)

AsPC-1 (pancreatic cancer) and H-1975 (lung cancer) are typical examples of aggregated cancer cell lines, where blurred cell boundaries often make image-based segmentation challenging. By combining the advanced imaging algorithms of the LUNA-FX7™ with SpectraSlide® AP-1's uniform sample-loading structure and AO/PI pre-coating technology, cell counting variability is minimized, resulting in stable and consistent staining performance. Even under high-density or heterogeneous sample conditions, SpectraSlide® AP-1 effectively reduces staining variability, ensuring both accuracy and reliability in every measurement.
For more details, please refer to the "AsPC-1 & H-1975 Application Note."

HL60 and Jurkat (Hematologic and Immune Cells)

For hematopoietic (HL60, leukemia) and immune (Jurkat, T lymphocyte) cell lines, SpectraSlide® AP-1 minimizes procedural variability through its AO/PI pre-coated surface and Click-Dip-Release loading mechanism. Without the need for reagent preparation or staining steps, measurements can be performed immediately under consistent conditions, reducing user-dependent error. This results in significant improvements in both accuracy and reproducibility of cell counting when used with the LUNA-FX7™.
For more details, please refer to the "HL60 & Jurkat Application Note."

These validation results demonstrate that SpectraSlide® AP-1 is not merely a convenience accessory, but a core component that enhances the accuracy and reproducibility of AO/PI-based cell counting. By simplifying the staining workflow and eliminating unnecessary preparation steps, researchers can obtain trustworthy data more quickly and efficiently.

User Guide – The One-Touch Workflow: Click, Dip, Release

Operating the SpectraSlide® AP-1 is as simple as three steps. With no need for complex pipetting or manual staining, anyone can achieve consistent and reproducible cell counting results.

Three Basic Steps

1. **Click** – Press the rubber dome at the top of the slide to expel the internal air.
2. **Dip** – Submerge the slide port into the sample tube until it is fully immersed.
3. **Release** – Slowly release the rubber dome to automatically draw the sample into the slide channel.

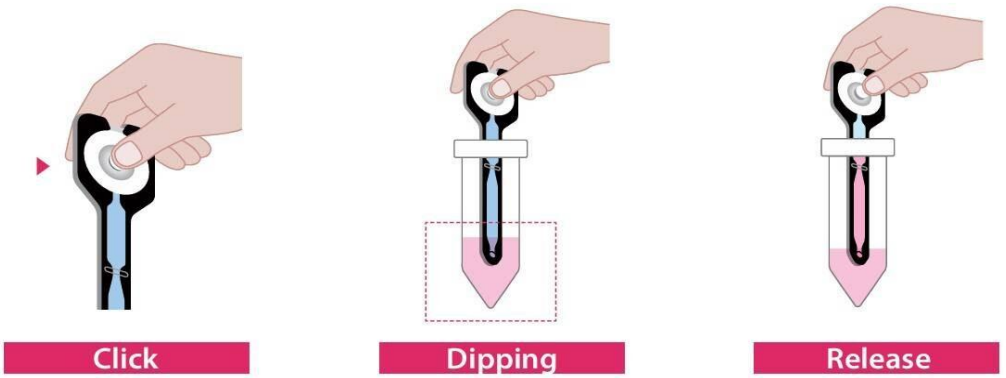

***Figure 3.** SpectraSlide® AP-1 – The simple three-step Click–Dip–Release workflow.*

Step-by-Step Instructions

1. Carefully open the package and remove the slide.
2. Press the rubber dome to release the internal air.
3. Submerge the slide port into the sample tube.
4. Slowly release the rubber dome to draw the sample into the slide channel.
5. Check that the sample has reached the marked sample line on the slide.
6. Wipe off any residual liquid around the slide, then place it into the SlideBed™.
7. Allow about 30 seconds for the cells to stabilize before inserting the slide into the LUNA-FX7™.

Usage Tips

· **30-second delay**: For small cells (e.g., splenocytes, nuclei) or low-density samples, it is recommended to wait approximately 30 seconds before measurement to allow cells to settle into the focal plane.

· **Importance of SlideBed™**: The SlideBed™ frame prevents residual liquid from entering the instrument, reducing contamination risk and extending instrument lifespan.

Convenience You Can Feel in the Lab

The advantages of SpectraSlide® AP-1 go far beyond accurate data — it also delivers tangible comfort and efficiency in everyday lab work.

· No pipetting required → Less operator fatigue
· No reagent preparation → Shorter experiment time
· Single loading, sufficient data → Fewer repeat measurements
· Seamless integration with LUNA-FX7™ → Simplified workflow

These benefits are especially valuable in high-throughput environments, where researchers process dozens of samples each day.

Conclusion: The One-Touch Era of Cell Counting

The SpectraSlide® AP-1 is not just an accessory — it redefines the entire cell counting workflow. Researchers no longer need to handle pipettes or prepare dyes; with a single slide, they can obtain faster and more accurate cell counting results. From QC and validation to bioprocess analysis, the Logos Biosystems workflow now seamlessly integrates the SpectraSlide® AP-1, delivering a complete cell counting solution that combines reliability, efficiency, and simplicity.

Frequently Asked Questions (FAQ)

Q1. Which instrument is compatible with the SpectraSlide® AP-1?

A. In general, more reliable results are obtained when cells are allowed to recover after thawing rather than being measured immediately. A commonly recommended approach is to remove DMSO and incubate the cells at 37°C for approximately 30 minutes to 1 hour before evaluation. However, protocols may need to be adjusted depending on the cell type and experimental purpose.

Q2. Can the slide be washed or reused after use?

A. No. The SpectraSlide® AP-1 is a single-use disposable slide. Reusing it may cause contamination, dye residue, or measurement errors, so it should be discarded after one use.

Q3. Do I need to change any settings on the LUNA-FX7™ when using the SpectraSlide® AP-1 ?

A. No special adjustments are required. Just like other compatible slides, the SpectraSlide® AP-1 should simply be set to its dedicated mode (Spectra / SpectraMax Mode) before use. No additional software settings need to be changed.