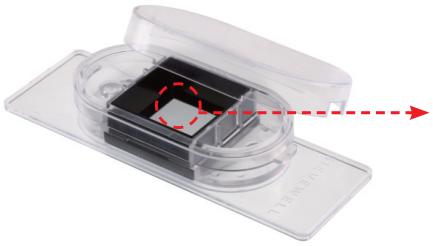
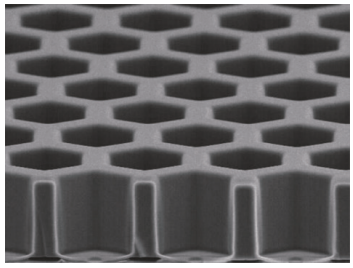
SIEVEWELL

Revolutionary Single Cell Analysis Platform

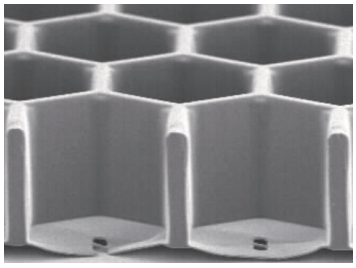
Achieve Superior Single Cell Capture Efficiency with Our Breakthrough Nanowell Technology





20 µm nanowell

370,000 nanowells/slide



50 µm nanowell

90,000 nanowells/slide

Transform Your Research Workflow

Precision Cell Trapping

Advanced nanowell design ensures single cell isolation with minimal overlap

Complete Workflow

From culture to analysis - staining, imaging, and assays in one platform

High Throughput

Process thousands of single cells simultaneously for robust statistical analysis

Rare Cell Detection

Identify and isolate rare cell populations with exceptional efficiency

The SIEVEWELL Slide

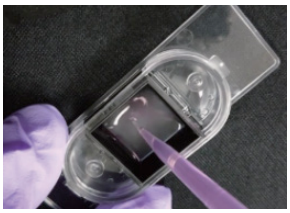
Single cell analysis requires effective cell arraying, yet conventional approaches face inherent limitations. Traditional microcavity arrays rely on sedimentation for cell distribution, where cells settle randomly into cavities following a Poisson distribution. This random distribution creates cell overlap, which interferes with single cell imaging and isolation, resulting in relatively low capture rates.

SIEVEWELL™ technology addresses these limitations through an innovative flow-based capture mechanism. The system features two pores strategically positioned at the bottom of each nanowell, which work in conjunction with controlled liquid flow. When cell suspension is loaded, aspiration through side ports creates directional flow from the inner liquid chamber outward. Once a cell occupies a nanowell, it blocks the pores and reduces flow through that specific well, automatically redirecting subseqent cells to available nanowells. This creates a self-regulating system that significantly improves single cell capture efficiency.

Simple 3-Step Protocol

No fluidic system or specialized instrument required - uses standard pipette

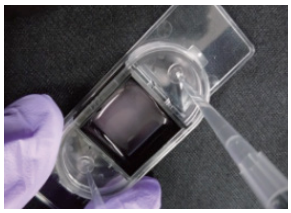
1



Load Cell Suspension

Add fluid to center chamber using standard pipette

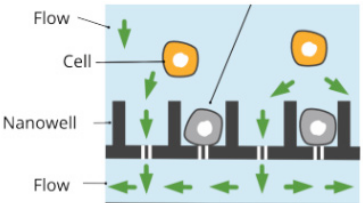
2



Create Directional Flow

Aspirate fluid from side ports to generate controlled flow

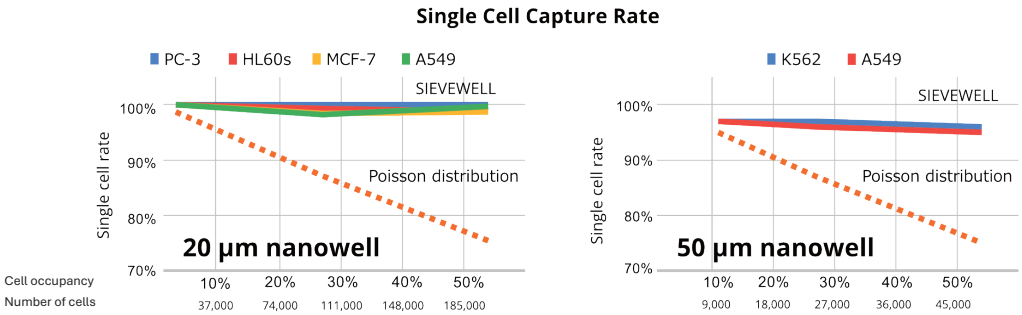
3



Cell Trapping

Cells self-organize into nanowells through flow dynamics

Proven Superior Performance



SIEVEWELL 20 µm (left) and 50 µm (right) nanowells demonstrate superior single cell capture rates compared to theoretical Poisson distribution (orange dotted line) across multiple cell lines (PC-3, HL60s, MCF-7, A549, K562). The flow-based capture mechanism consistently outperforms random distribution by redirecting cells to empty nanowells after pore blockage occurs.

Key Advantages

- **> 95% single cell capture** - vs 60-80% traditional methods
- **Standard pipette operation -** no specialized equipment needed
- **Self-regulating system -** optimal performance at any cell density
- **High throughput capability -** up to 370,000 nanowells per slide

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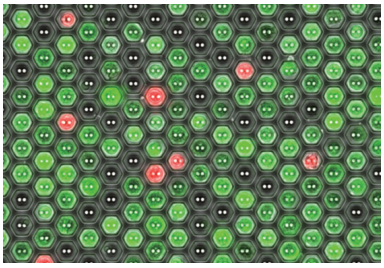
Inspiration for Life Science

High Density Cell Arraying

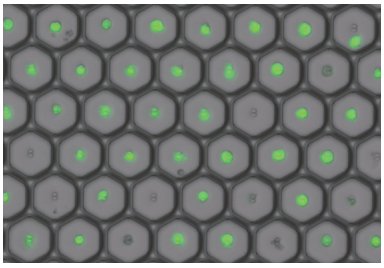
To avoid cell overlap in single cell imaging, researchers typically seed cells at very low densities across multiple slides or plates. This approach is:

- **Resource intensive** - requires many slides, plates, and reagents
- **Time consuming** - necessitates imaging multiple locations to find cells of interest
- **Inefficient** - most of the imaging area is empty space

The SIEVEWELL Solution: High-Density Arrays. SIEVEWELL packs 370,000 (20 µm) or 90,000 (50 µm) nanowells into just 17 × 17 mm, enabling high-density single cell arrays without overlap, dramatically reducing slides, reagents, and imaging time.



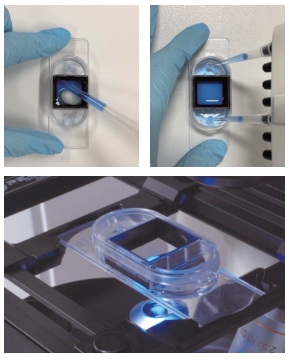
20 µm nanowell, 370,000 wells

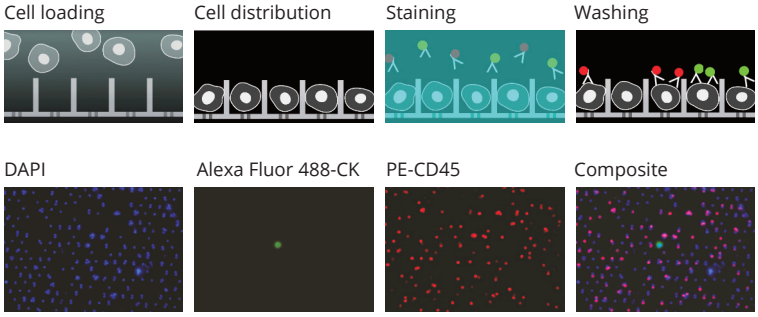


50 µm nanowell, 90,000 wells

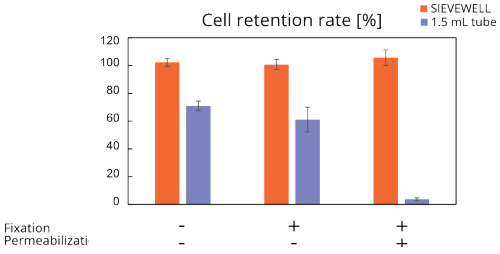
On-Chip Staining

Conventional cell staining requires multiple wash and transfer steps that risk losing rare, valuable cells like circulating tumor cells. SIEVEWELL™'s nanopores are smaller than mammalian cells, physically trapping cells during staining protocols. This results in minimal cell loss during fixation, permeabilization, blocking, antibody incubation, and washing.





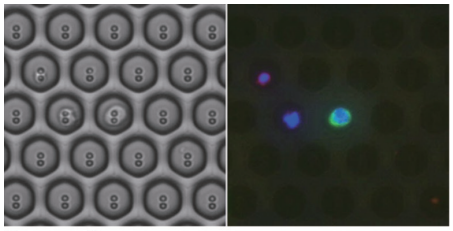
Human PBMC spiked with MCF7 cell were loaded. Cells were fixed with 4% PFA, permeabilized with 0.2 % Triton X-100, blocked with Protein Block, stained with a cocktail of PE mouse anti-human CD45 antibody, Alexa Fluor 488 mouse anti-human CK antibody and DAPI, then washed.



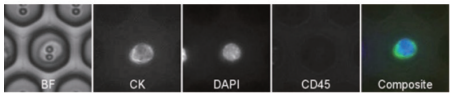
Direct comparison of staining procedure.
A549 cells were stained using 1.5 mL tube or SIEVEWELL 20 µm.
Case 1: no fixation, no permeabilization
Case 2: fixation with 4 % PFA, no permeabilization
Case 3: fixation with 4 % PFA, permeabilization with 0.2 % Triton X-100

Alexa Fluor is a registered trademark of Molecular Probes Inc, a Thermo Fisher Scientific Company, in the United States and other countries.

Circulating tumor cell from patient blood



20 µm nanowell

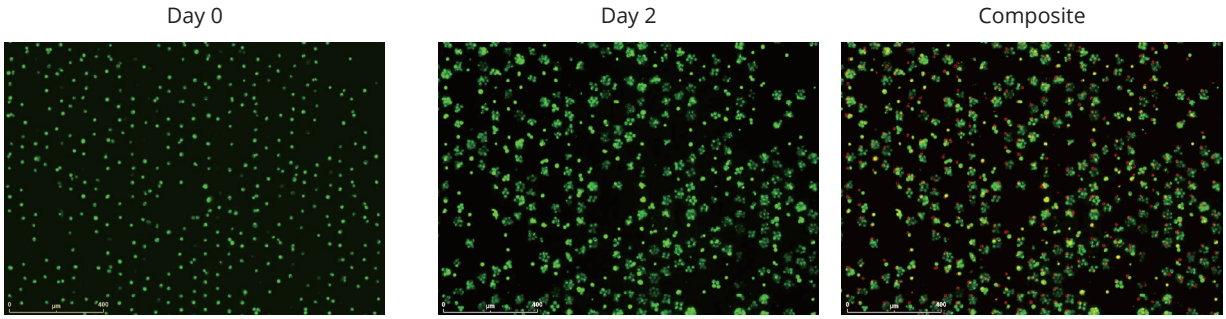


Data provided by Professor Hans Neubauer, Department of Obstetrics and Gynaecology, University Hospital and Medical Faculty of the Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Single Cell Growth Monitoring Made Simple

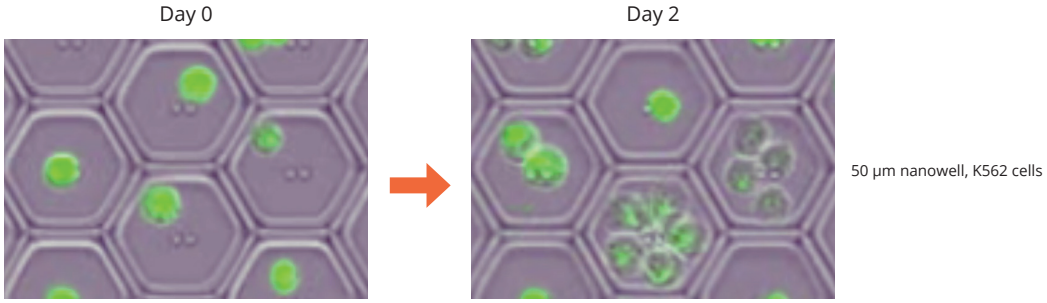
Traditional approaches use limiting dilution or cell sorting to isolate single cells into microwell plates. Cell sorting requires expensive equipment and expertise, while both methods need multiple plates and manual verification of single cell occupancy. Tracking growth is difficult because suspension cells float freely, making lineage tracing nearly impossible.

SIEVEWELL™ captures individual cells in nanowells where they stay confined during proliferation, enabling simultaneous monitoring of thousands of single cell lineages on one device—no cell sorter required.

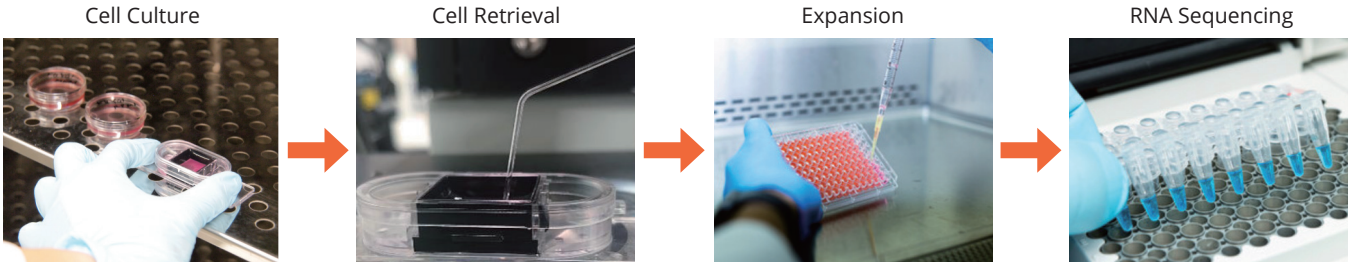


K562 cells (stained with CellBrite Green) were cultured in SIEVEWELL Slide 50 µm. Images were taken every 2 hours with IncuCyte S3 (10x objective lens). Images of day 0 and day 2 were ovelayed using ImageJ.

Monitoring of cell growth from a single cell shows that cell lines are a mixture of cells with different growth rates. K562 cells are a mixture of cells with different growth rates, 18 hours, 26 hours and 38 hours. Cells in the nanowell were retrieved using a micromanipulator and transferred into 96-well microwell plates for further expansion, and RNA sequencing was conducted.



50 µm nanowell, K562 cells



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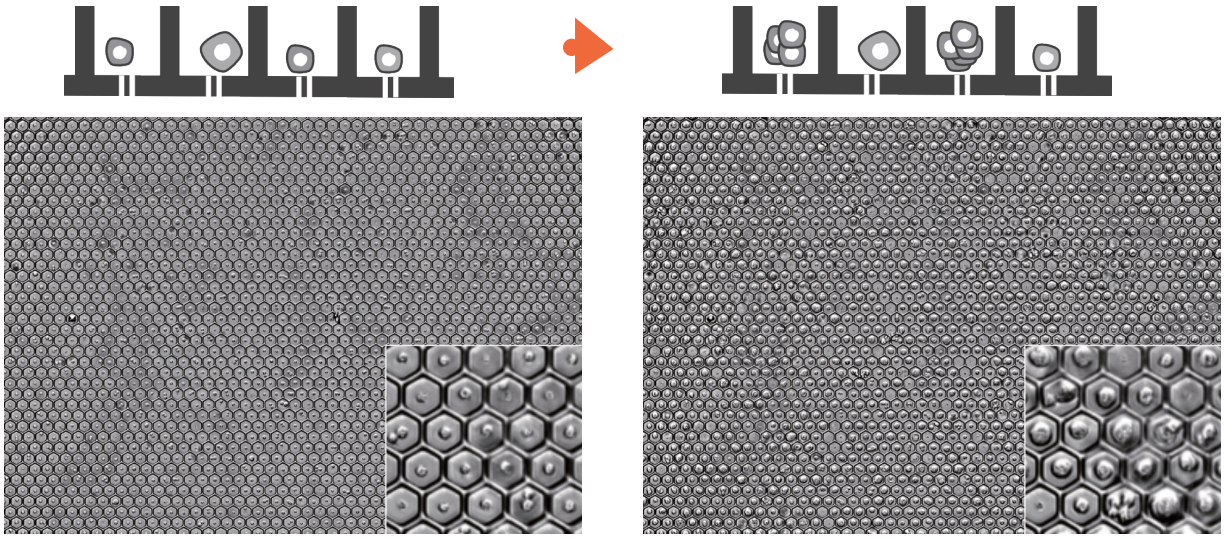
Spheroid Formation

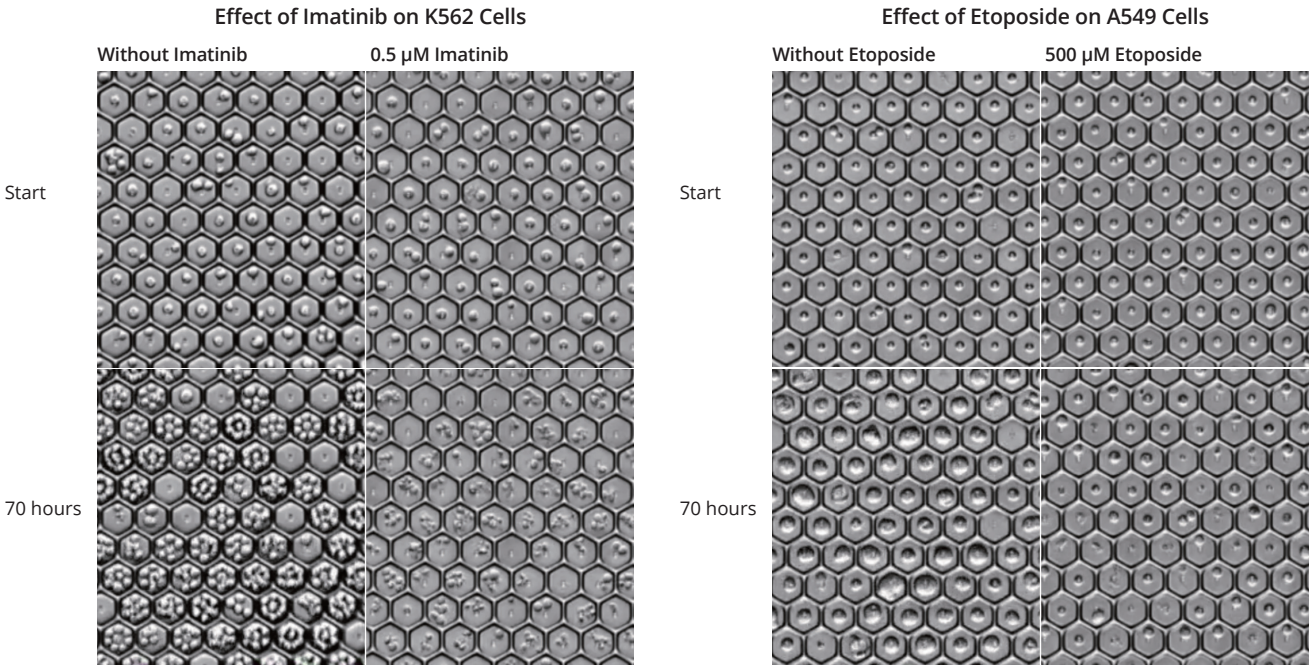
The ability of a single cell to form a spheroid is considered a potential self-renewal ability. SIEVEWELL™ 50 µm allows researchers to monitor spheroid development from thousands of individual cells simultaneously, generating robust datasets for statistical analysis.



A549 cells were cultured in SIEVEWELL Slide 50 µm. Images were taken every 1 hour with CM30 Incubation Monitoring System, Evident.

Single-Cell Drug Response Profiling

SIEVEWELL enables real-time monitoring of individual cell responses to drug treatments through time-lapse imaging. High-density arrays capture the behavior of over 1,000 cells simultaneously, revealing response heterogeneity and identifying rare drug-resistant subpopulations.

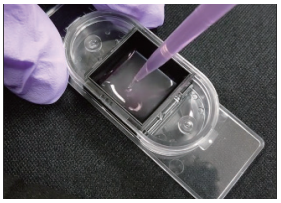


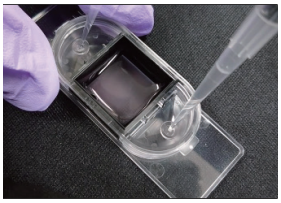
Cells were cultured in SIEVEWELL Slide 50 µm. Images were taken every 1 hour with CM30 Incubation Monitoring System, Evident.

Cell-to-Cell Interaction Studies

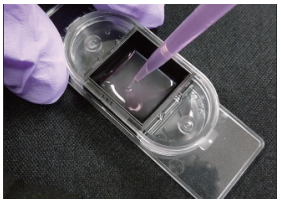
SIEVEWELL™ 50 µm enables controlled pairing of different cell types to study direct cell-cell interactions. The dual-loading protocol combines flow-based capture for the first cell type with gravitational sedimentation for the second, creating thousands of 1:1 cell pairs on a single device for statistical analysis.

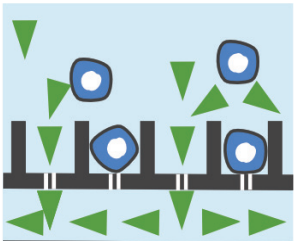
Load 1st Cell Type
Flow based procedure

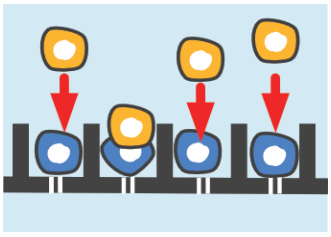




Load 2nd Cell Type
Sedimentation based procedure



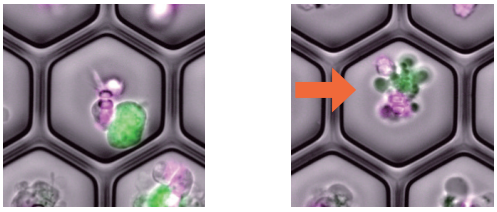




Immune Cell Killing Assay

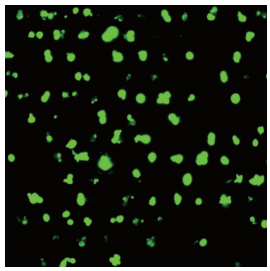
Cytotoxic immune cells can recognize and kill target cancer cells. Immune cell killing assays are a valuable tool for immuno-oncology research projects for in vitro assessment of these cells. With SIEVEWELL, the dynamic interactions of immune and cancer cells can be visualized.

Apoptosis induced by NK cell

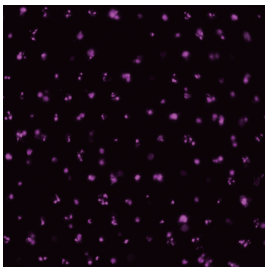


The erythroleukemia K562 cell is known as an NK-cell sensitive target. Calcein AM-stained K562 cells were loaded into SIEVEWELL 50 µm, then KHYG-1 cells, NK leukemia cell line, were loaded by sedimentation. Time-lapse images were taken every 3 minutes.

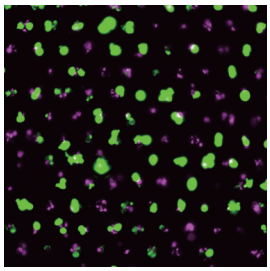
Target: K562



Effector: KHYG-1



Composite



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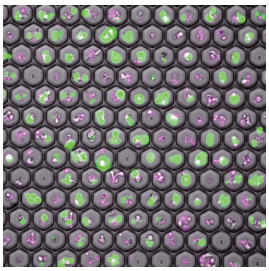

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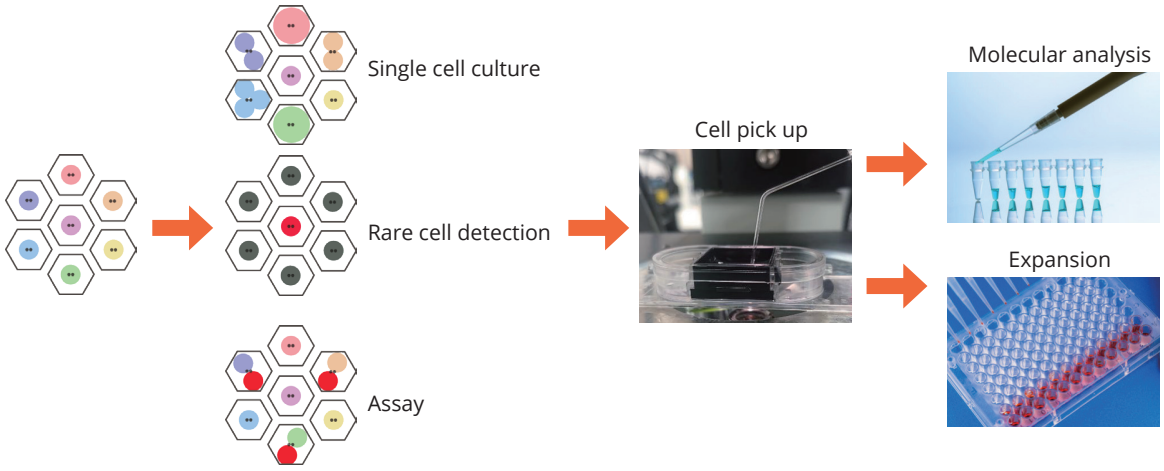
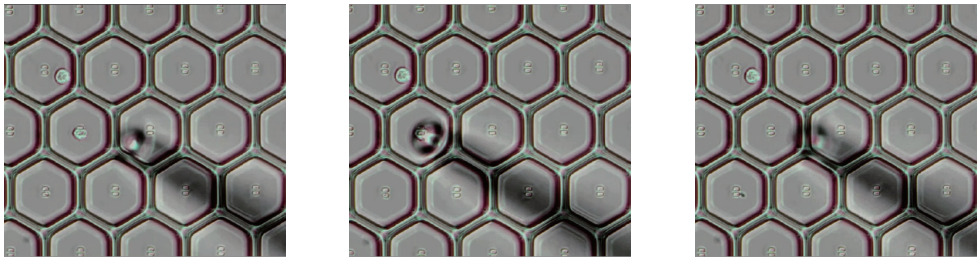
Cell Isolation and Retrieval

The SIEVEWELL™ slide's open-top design enables direct access with glass capillary tools for precise cell isolation. Retrieve single cells for cloning, collect spheroids, or isolate rare cells identified during screening—all without transferring between platforms.

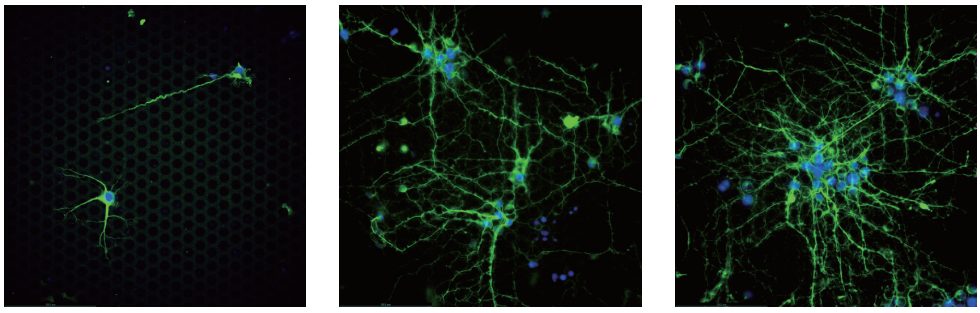




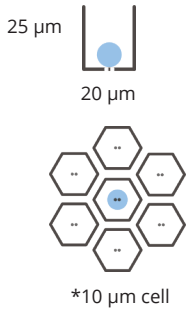
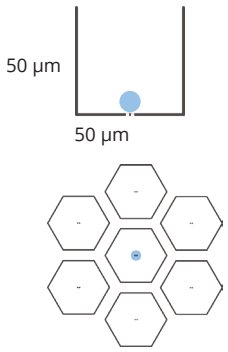
Surface Modification for Adherent Cell Culture

Surface of nanowell is coated with polymer to prevent cell attachment. However, for adherent cell culture, protein binding surface type is available for coating with ECM, e.g., laminin, collagen by request.

On-Chip Neural Differentiation of PC12 Cells



SIEVEWELL 20 µm was coated with Cellmatrix Type IV (Collagen Type IV, Nitta Gelatin Inc). Rat pheochromocytoma cell line PC12 cells were loaded into SIEVEWELL 20 µm. Cells were cultured with RPMI 1640/10% horse serum/5% fetal bovine serum containing 10 ng/µL NGF. After 7 days, cells were fixed with PFA, permeabilized with 0.05% Tween 20/PBS, blocked with 1%BSA/PBS, stained with mouse anti-rat Tubulin β3 (TUBB3) antibody (Clone, TUJ1) followed by staining with Alexa Fluor Plus 488 labelled anti-mouse IgG antibody and DAPI. Images were taken with THUNDER Imaging Systems (Leica Microsystems).

Specifications	SIEVEWELL™ Slide	
Product code	TOK-SWS-2001-5	TOK-SWS-5001-5
Nanowell size	Width 20 µm、Depth 25 µm	Width 50 µm、Depth 50 µm
Number of nanowell	370,000	90,000
		

Dimension.....25 mm x 75 mm x 12 mm
Chamber size.....17 mm x 17 mm, Cell repellent surface
Working volume.....0.3 - 2 mL
Material.....PS, PC, Biocompatible polymer
Package.....5 slides per box (sterilized)

Ordering Details

References

Therapeutic application of human type 2 innate lymphoid cells via induction of granzyme B-mediated tumor cell death
Cell. 2024 Feb 1;187(3):624-641.e23.
doi: https://doi.org/10.1016/j.cell.2023.12.015

Quantitative Single-Cell Mass Spectrometry Provides a Highly Resolved Analysis of Natural Product Biosynthesis Partitioning in Plants *Journal of the American Chemical Society*. 2024 Aug; 146(34) : 23891.
doi: https://doi.org/10.1021/jacs.4c06336

Single-cell multi-omics enabled discovery of alkaloid biosynthetic pathway genes in the medical plant *Catharanthus roseus*.
Nature Chem Biol. 2023 Aug;19(8):1031-1041.
doi: https://doi.org/10.1038/s41589-023-01327-0

Implementing microwell slides for detection and isolation of single circulating tumor cells from complex cell suspensions
Cytometry A. 2022 Dec;101(12):1057-1067.
doi: https://doi.org/10.1002/cyto.a.24660

Validation of Cell-Free RNA and Circulating Tumor Cells for Molecular Marker Analysis in Metastatic Prostate Cancer
Biomedicines. 2021 Aug; 9(8): 1004.
doi: https://doi.org/10.3390/biomedicines9081004

Improvement of single circulating tumor cells isolation with sievewell slides *Geburtshilfe Frauenheilkd* 2020; 80(10): e212.
doi: https://doi.org/10.1055/s-0040-1718200

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