

FluidicLab®



**Microfluidic  
comprehensive  
experimental platform**





# COMPANY PROFILE



**30+**

R&D experts!

**10**

Years of service

**2000+**

Customer worldwide





# FluidicLab is committed to providing the professional microfluidic solutions.

## We focus on...

### 01 Development & manufacture of microfluidic control systems.

We provide integrated systems, such as smart LNP generator, microdroplet/microsphere generator, microfluidics distribution system, along with standard microfluidic devices including precision pressure controller, flow sensor, sensor reader, microfluidic distribution valve, solenoid valve and controller, etc.

### 02 Design & fabrication of microfluidic chips.

We provide customized service of microfluidic PDMS/glass/COC chips from design to fabrication. Organ/organoid chip customization is also available.

### 03 Development & manufacture of ODM/OEM systems.

Since the beginning of our business, FluidicLab has developed equipment in mRNA vaccine production (for pilot scale), library construction for single-cell transcriptome analysis. Fluid control system for single-cell spatial transcriptome and its sample preparation, liquid handling for CAR-T cell preparation, and equipment for digital PCR are well developed.

### 04 CRO service.

Provide CRO of barcode beads, organoid cultivation, single cell encapsulation, etc., as well as technical consultations of optimizing experimental procedures and industrial scale-up production.



# SMART LNP GENERATOR S1

## LNP-S1



Smart LNP Generator (LNP-S1) is an experimental microfluidic device widely used in the research and development of nucleic acid drugs, vaccines, and other formulations for many customers. It plays an important role in basic research early process validation, and technology development stages. Compared to traditional preparation techniques, the LNP-S1 is efficient, easy to operate, with stable results and good reproducibility.

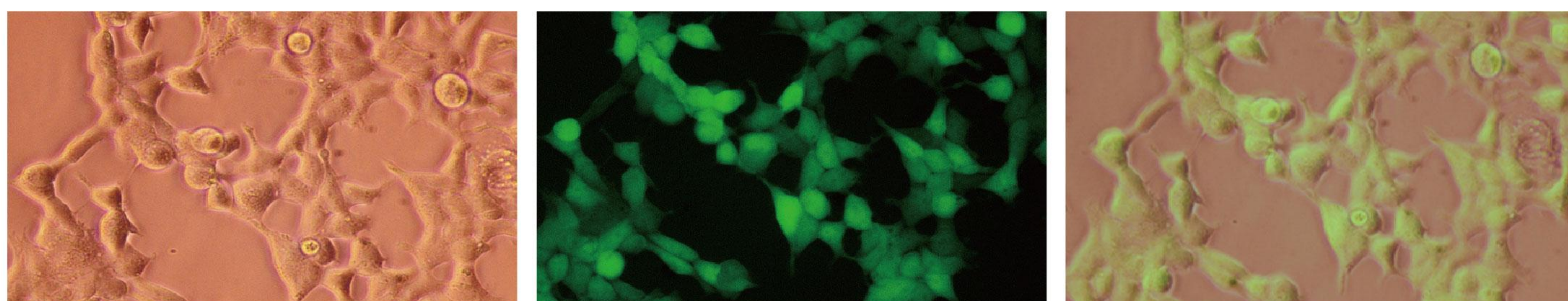
 **0.6~20 mL preparation volume**

 **0~36 mL/min<sup>[1]</sup>**

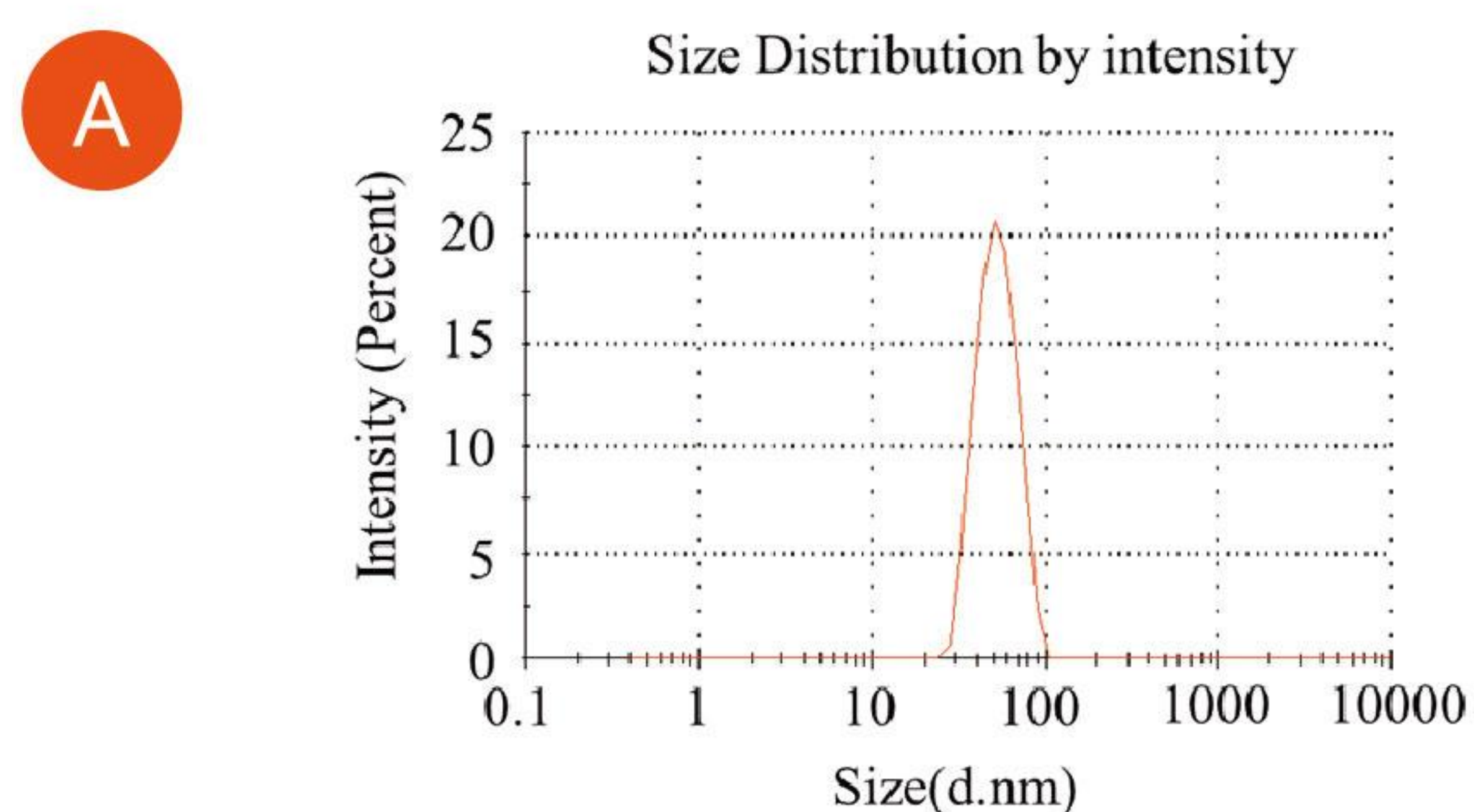
 **Dual-channel flow control, flowrate ratio can be set from 10:1 to 1:30**

[1]. Suitable syringe and flow rate rational should be chosen for maximum speed

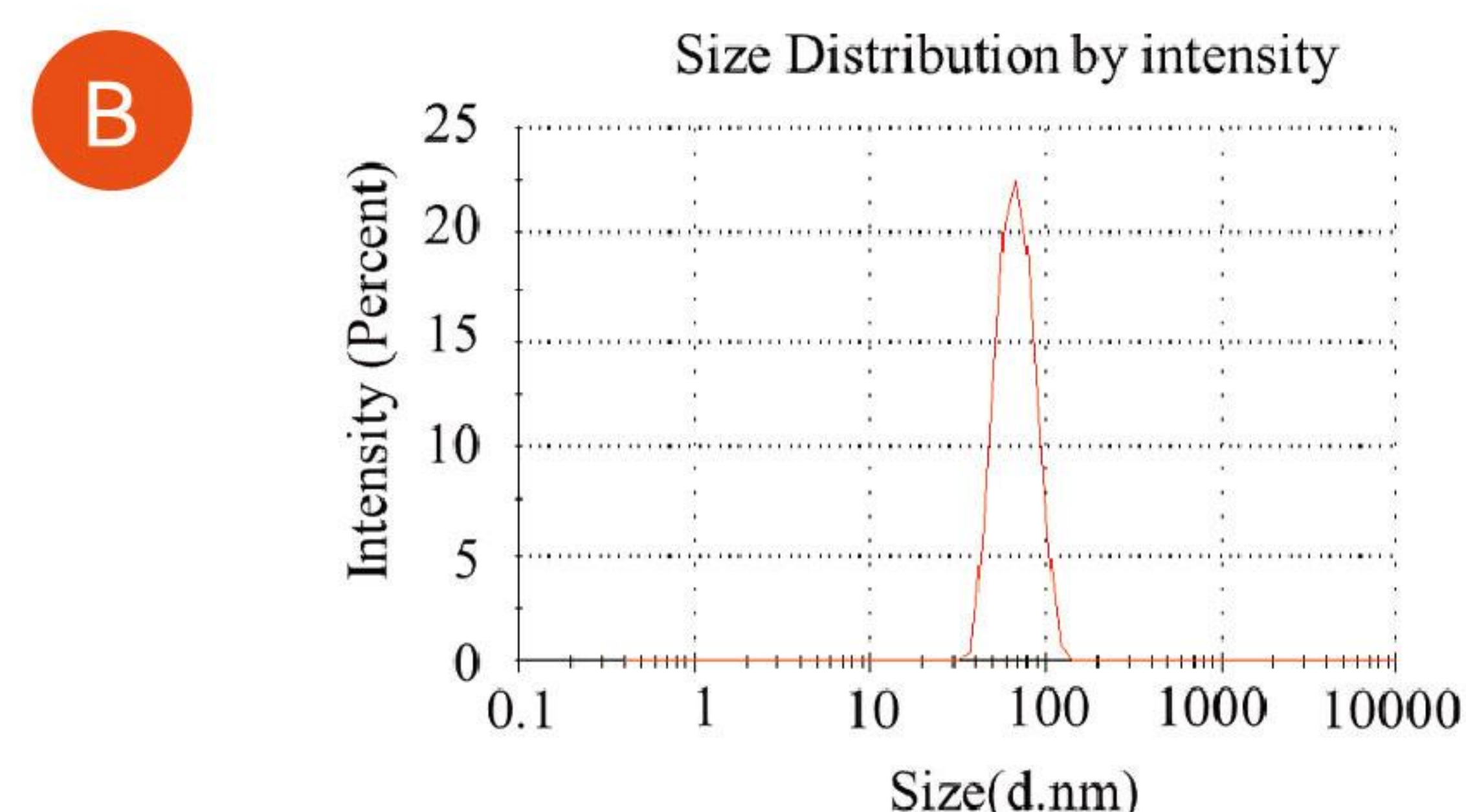
## Experimental Data



HEK-293T cells transfected by EGFP-LNP(16h after transfection)



Unloaded LNP size distribution (by intensity) after dilution (average size=50.77, PDI=0.045)



LNP-mRNA size distribution (by intensity) after dilution (average size=65.765, PDI=0.058)



# SMART NP(NANOPARTICLE) GENERATOR S2

NP-S2

In the progress of nanoparticle assembly (like LNP, liposome), uniform mixing of organic phase (like ethanol phase containing ionizable lipids) & aqueous phase (like citrate buffer containing RNA) is the key step. By leveraging the cutting-edge microfluidic technology, Smart NP Generator S2 (NP-S2) is capable of generating homogeneous nanoparticles with controlled size and high reproducibility. The very low reagent consumption, and easy of use, make the Smart NP Generator S2 the ideal platform for early-stage drug development.

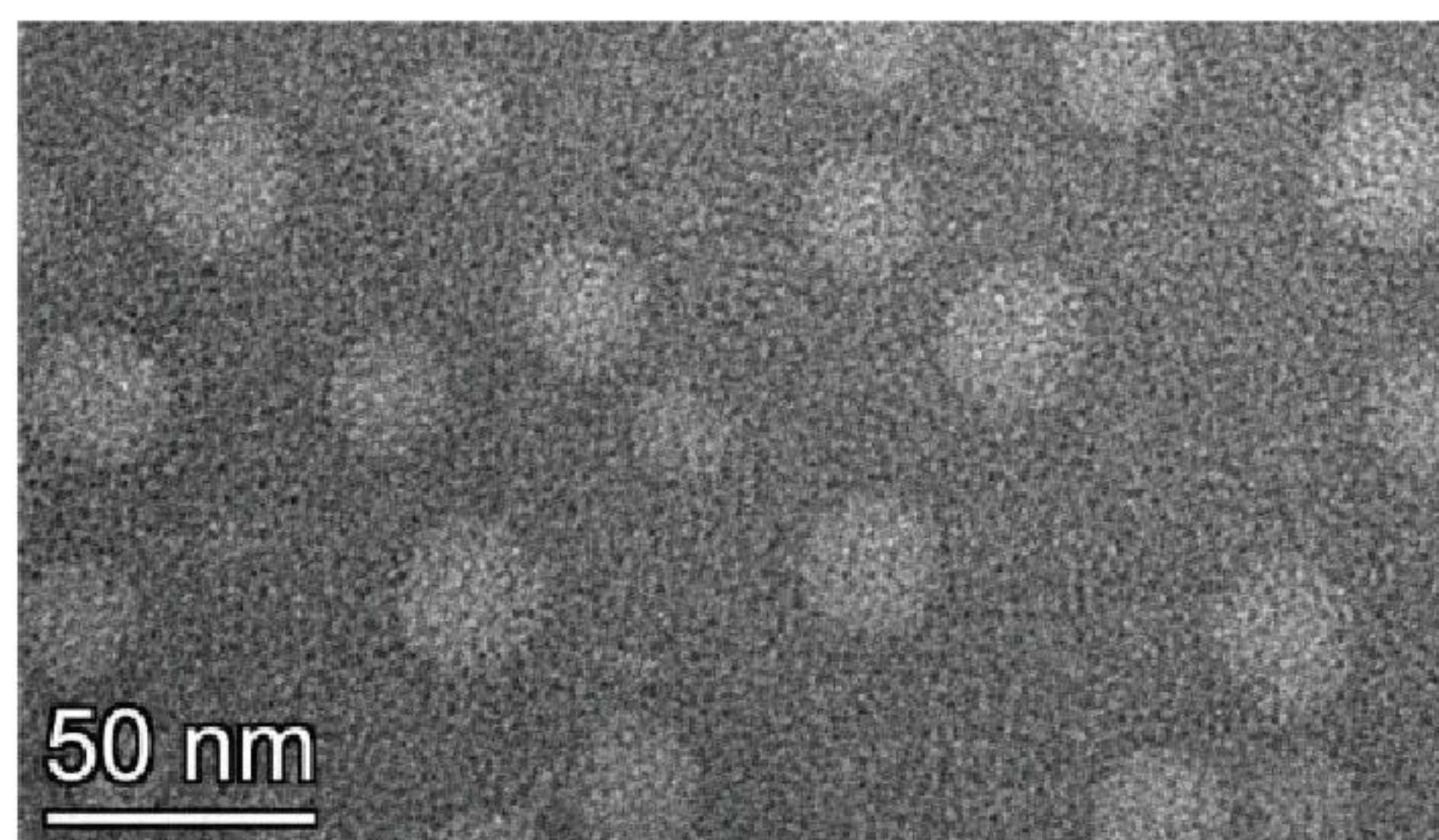


- 0.4~40 mL preparation volume
- 0~40 mL/min Total Flow Rate (TFR)<sup>[1]</sup>
- 10:1 ~ 1:30 Flow Rate Ratio (FFR)
- Equipped with heating module: room temperature ~80°C
- Data can be restored, recorded and reused. Software is updatable online
- Strong organic solvent is allowed to pass through, (Such as: acetone & dichloromethane)<sup>[2]</sup>

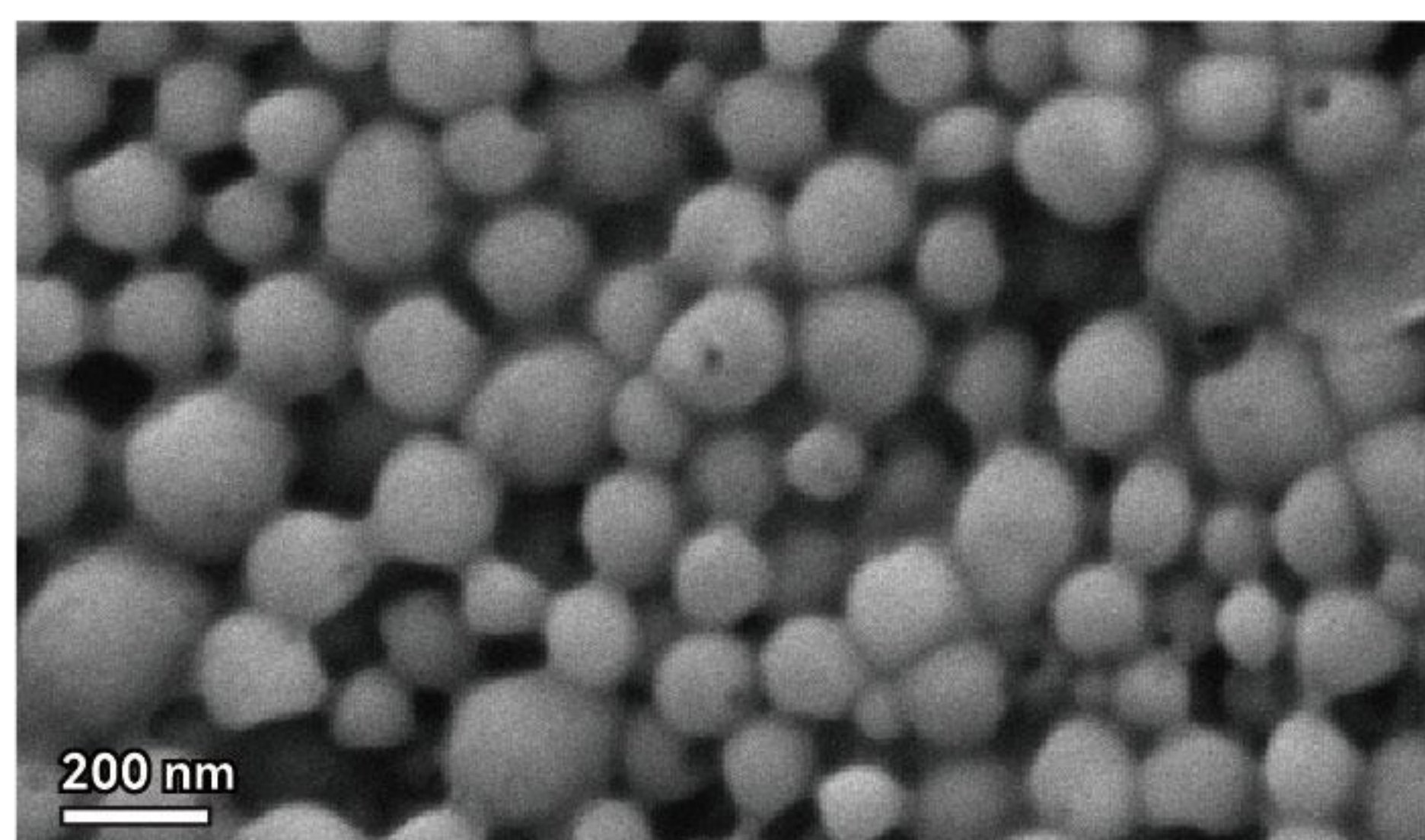
[1]. For maximum speed, suitable syringe and chip should be chosen.

[2]. Compatible with Metal-Glass chips only.

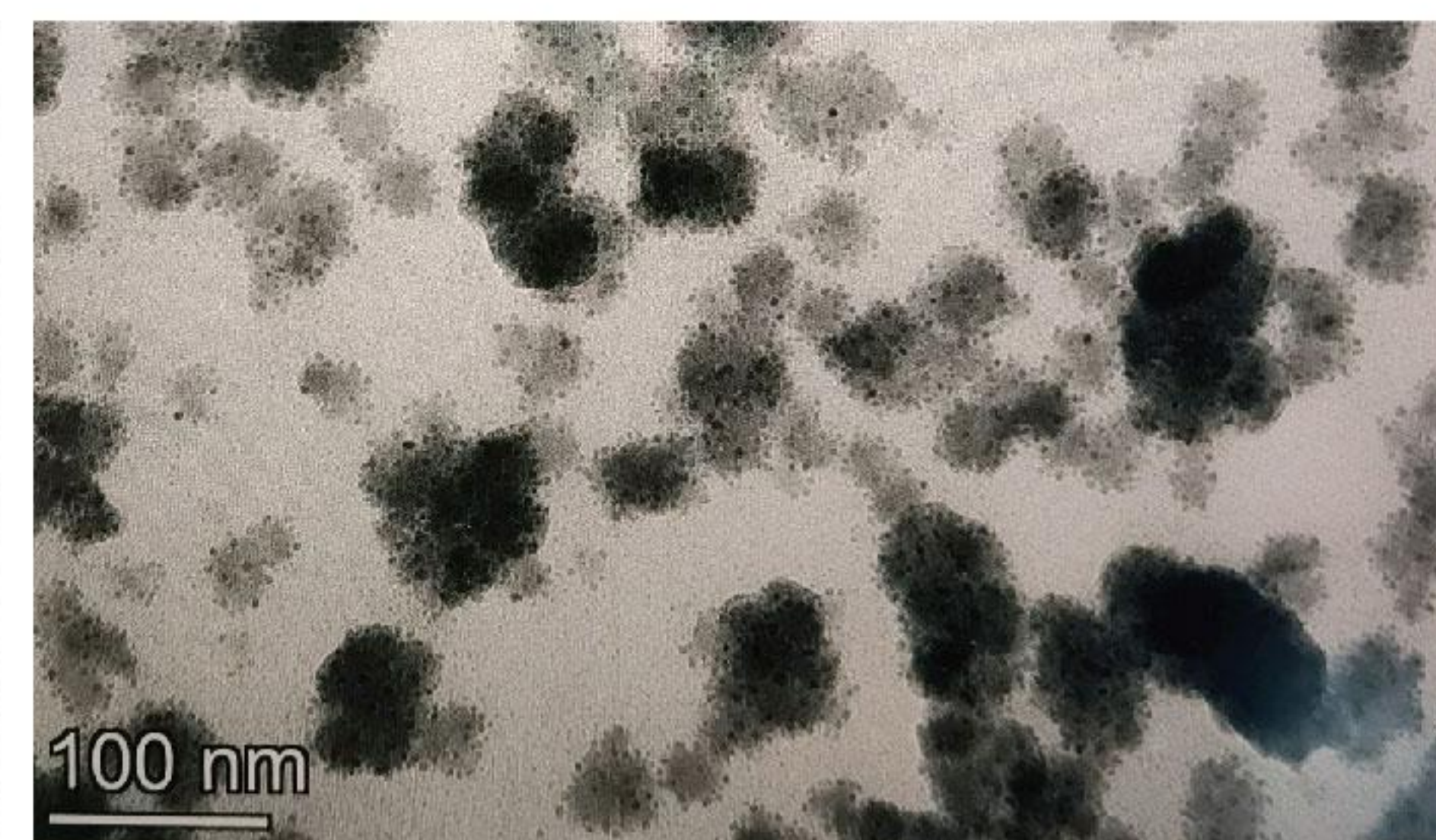
## Experimental Data



LNP TEM Image



PLGA Nanoparticles SEM Image



PLGA-Encapsulated Small  
Molecule Drug TEM Image



# MICROFLUIDIC FLOW CONTROLLER

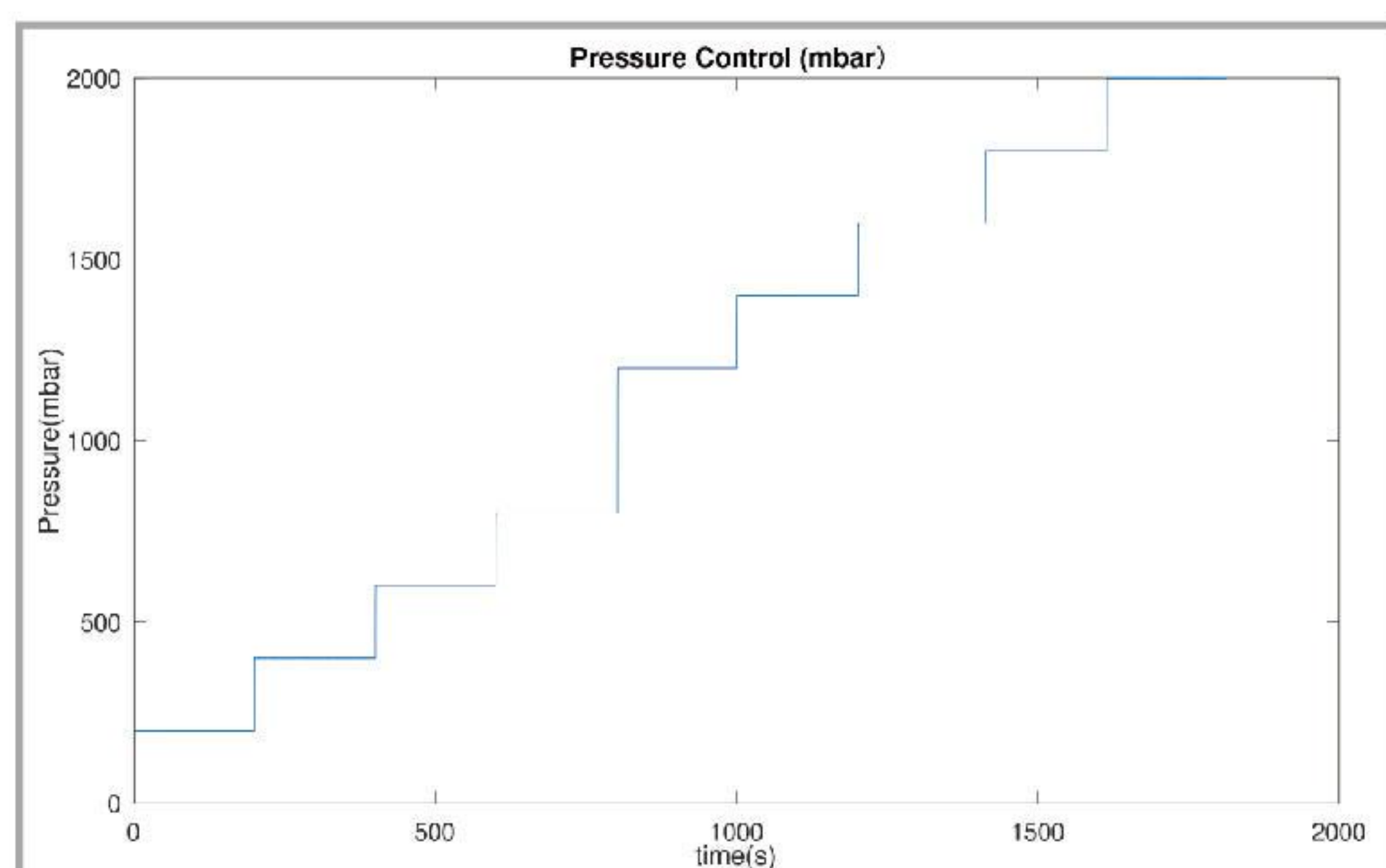
The Microfluidic Flow Controller (PC1) is an outstanding flow control system based on pressure control. One can accurately control pressure to push and pull liquid, achieving high precision and responsiveness in flow regulation with a personal computer.

PC1

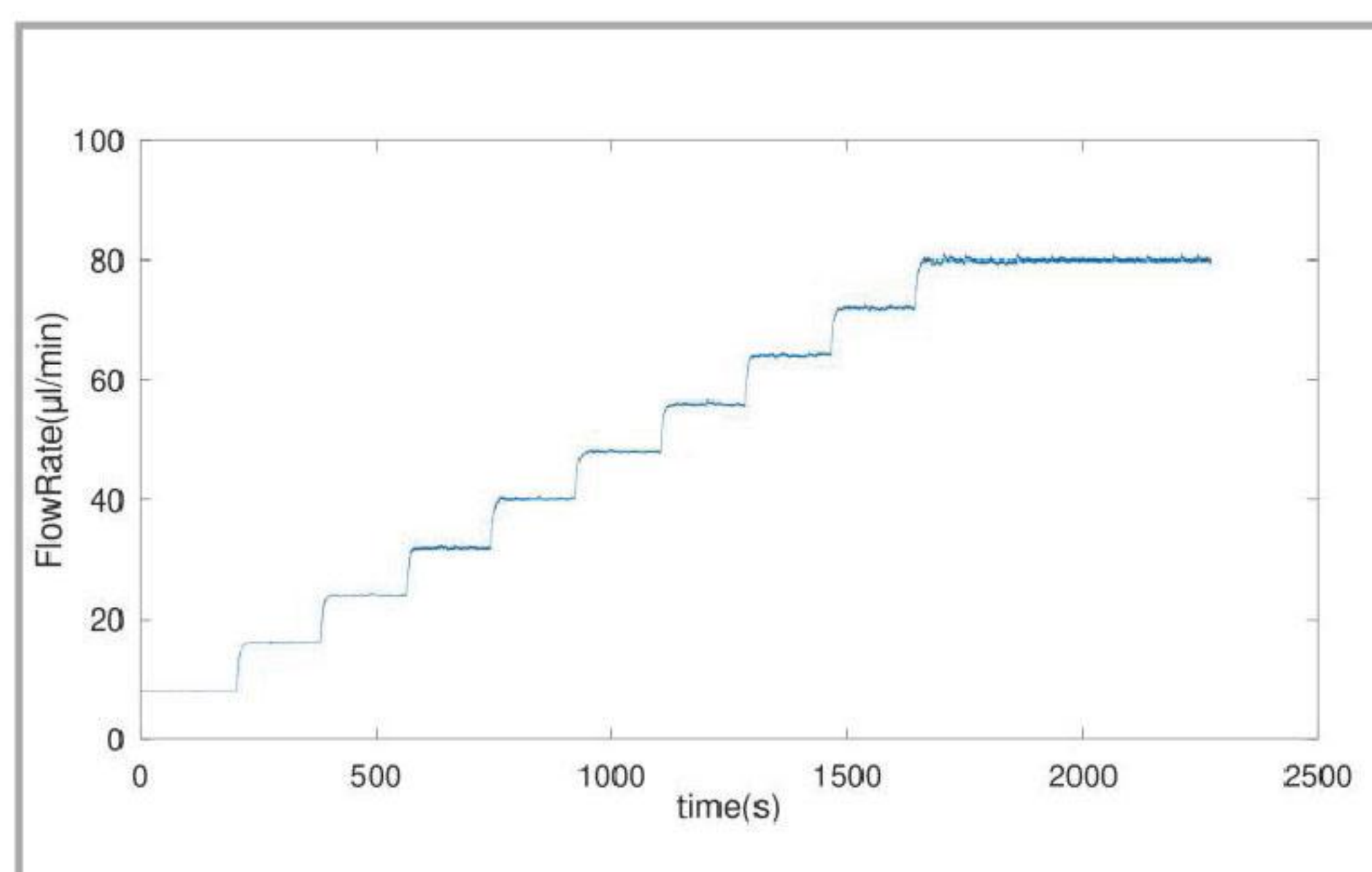


- ☒ High precision and responsiveness in pressure control
- ☒ Flexible pressure and/or vacuum control range
- ☒ Support pressure control waveform
- ☒ Support flow control modes
- ☒ Four independent pressure and/or vacuum control

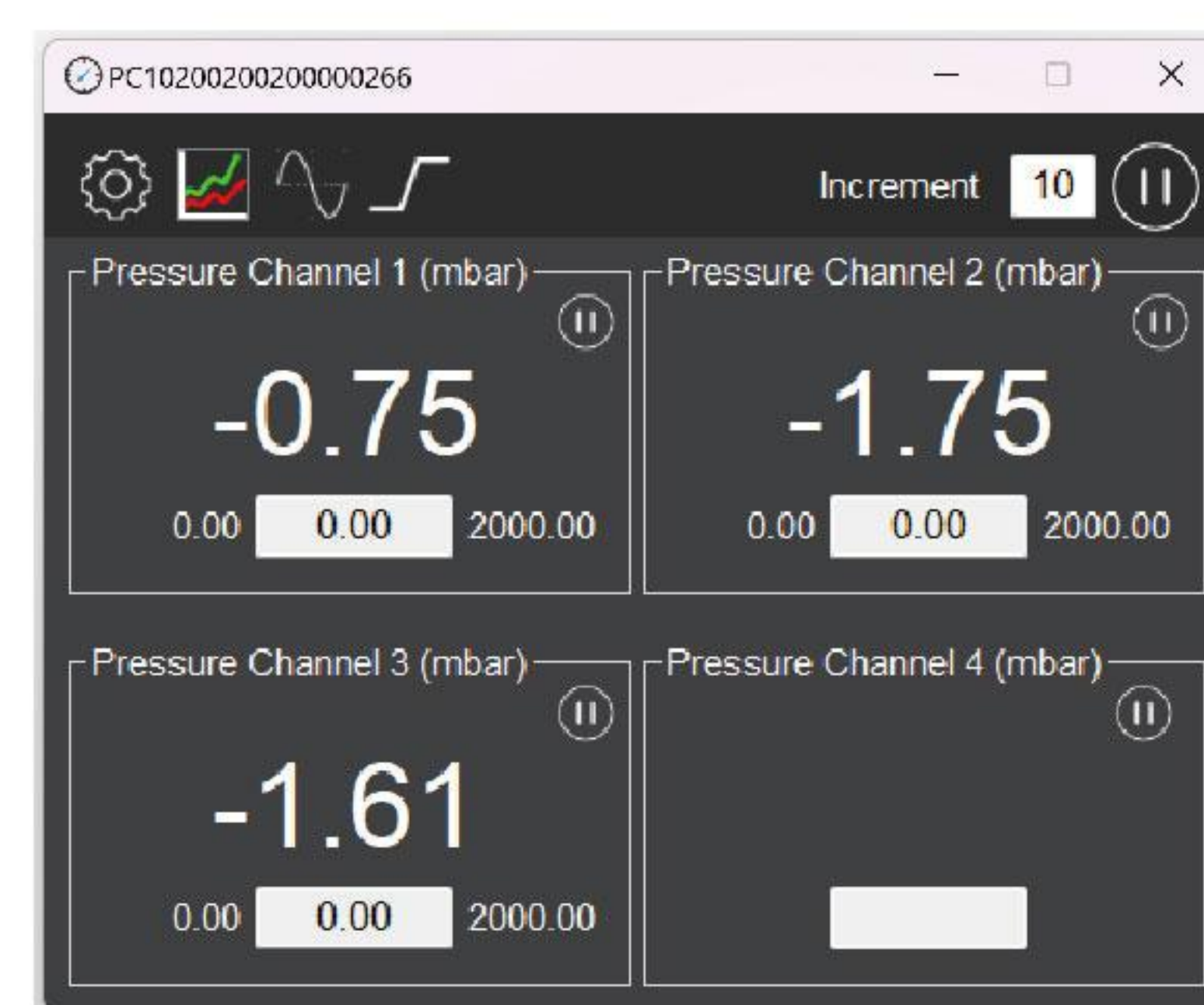
## Experimental Data



Outstanding microfluidic pressure control



Precise output of pulseless flow when connecting to a flow sensor



Customizability and upgradability



# Specifications

## PC1 pressure controller

PC1 Channel Pressure Range	0~200 mbar	0~2000 mbar	0~8000 mbar	-1000~1000 mbar	-1000~6000 mbar
PC1 Available Pressure Range	6~194 mbar	0~1940 mbar	0~7760 mbar	-9000~970 mbar	-900~5820 mbar
Pressure Stability	Fluctuation less than 0.02% of full scale				
Response Time	9 ms				
Pressure and Vacuum Supply	1.5~10 bar			-1 bar (Input Vacuum) 1.5~10 bar	-1 bar (Input Vacuum) 1.5~10 bar
Liquid Compatibility	Non-contact pump Any aqueous, oil, or biological sample solution				
Gas Compatibility	Any non-corrosive, non-explosive dry gas				

## Others

● Flow Control	
Flow Sensor Compatibility	Compatible with all FluidicLab flow sensors Monitoring and feedback loop flow control available
Full Scale Flow Rates	0.07 ~ ±40000 µL/min
Liquid Compatibility	Any non-strong alkali, non-strong acid, aqueous, partially oil, or biological sample solution.
Response Time	<40 ms
Working Temperature	10 ~ 50 °C
Store at	-10 ~ 60 °C
Features	both bidirectional and linear response
● Control & Monitoring	
Software Control	FluidicLab Suite Windows 7, 8, 10 and 11,both 32- and 64-bit versions supported
● Other	
Power Consumption	(24 V-50 Hz)
Casing Dimensions	(length×width×height): 220 mm × 200 mm × 110 mm
Weight	1.5~2.5 kg





\* The models of flow sensor are shown in the following table.



# PNEUMATIC PERFUSION CELL-CULTURE SYSTEM

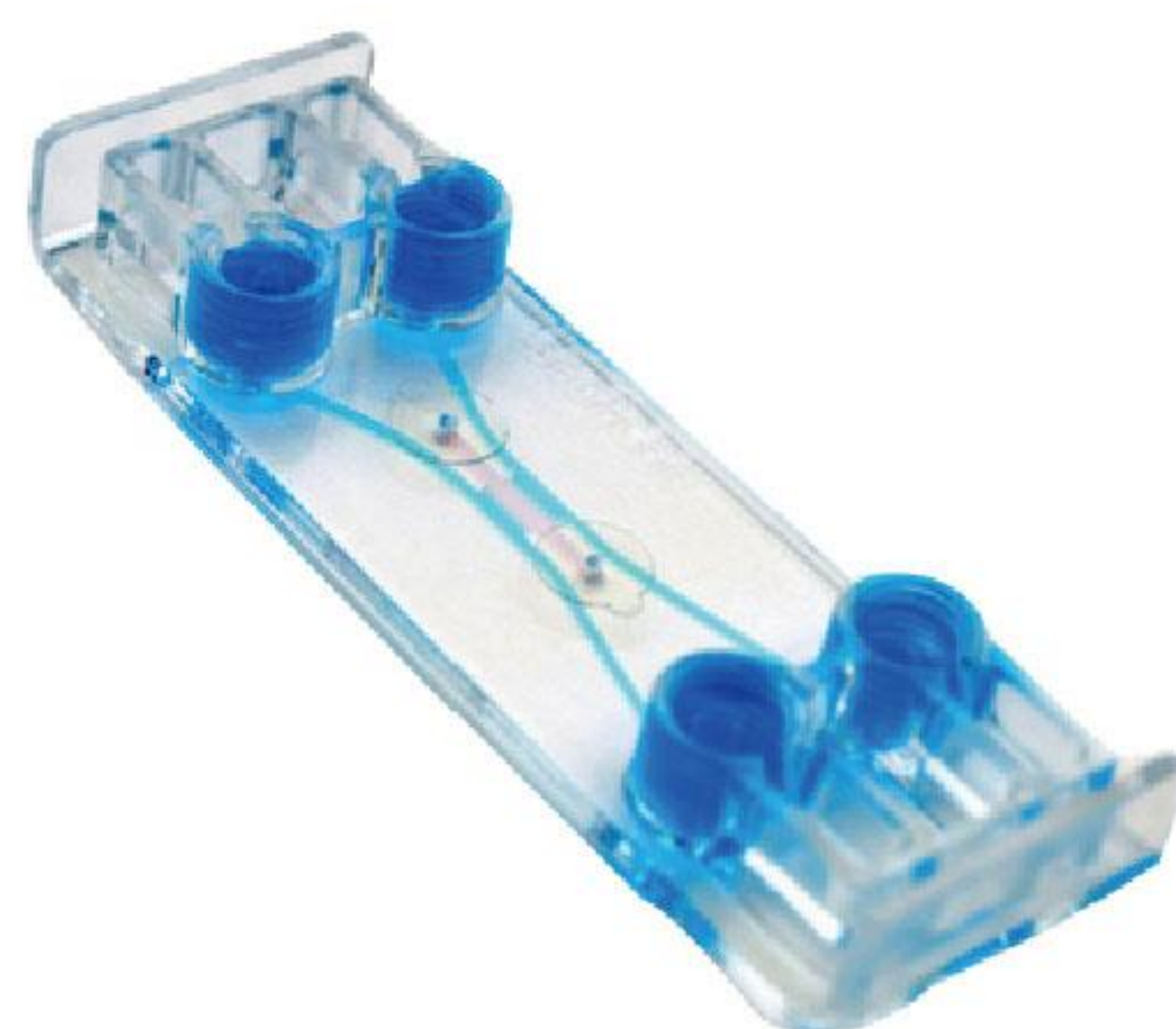
Compared to traditional static cell culture methods, the Pneumatic Perfusion Cell Culture System mimics the in vivo microenvironment by introducing complex environmental factors such as fluid shear stress, mechanical strain, and biochemical concentration gradients.

This system is ideal for continuous perfusion culture of cells and organoids. Through a specially designed mechanism, the culture medium circulates stably between two reservoirs while maintaining unidirectional flow within the chip, ensuring a stable and contamination-resistant culture environment.

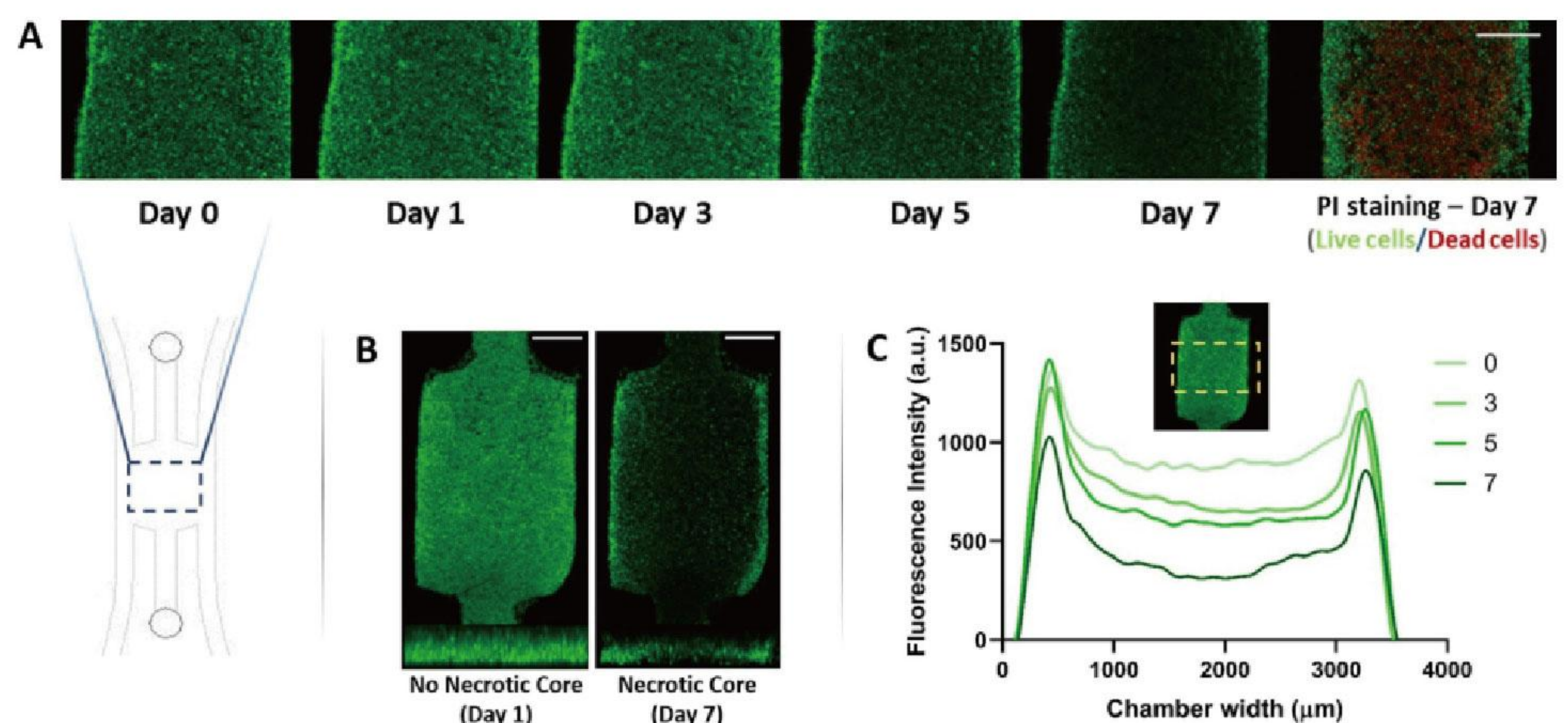
-  **Pneumatic-driven system for precise flowcontrol**
-  **Robust and reliable under high humidity**
-  **Specially designed for medium recirculation**
-  **Flexible and open for diverse experimental needs**

## ■ Gradient-Based Cell Culture

**Be-Gradient culture model**, consists of a central cell culture chamber flanked by two adjacent channels. By varying the concentration of a specific element in the side channels, a chemical gradient can be established across the central chamber.



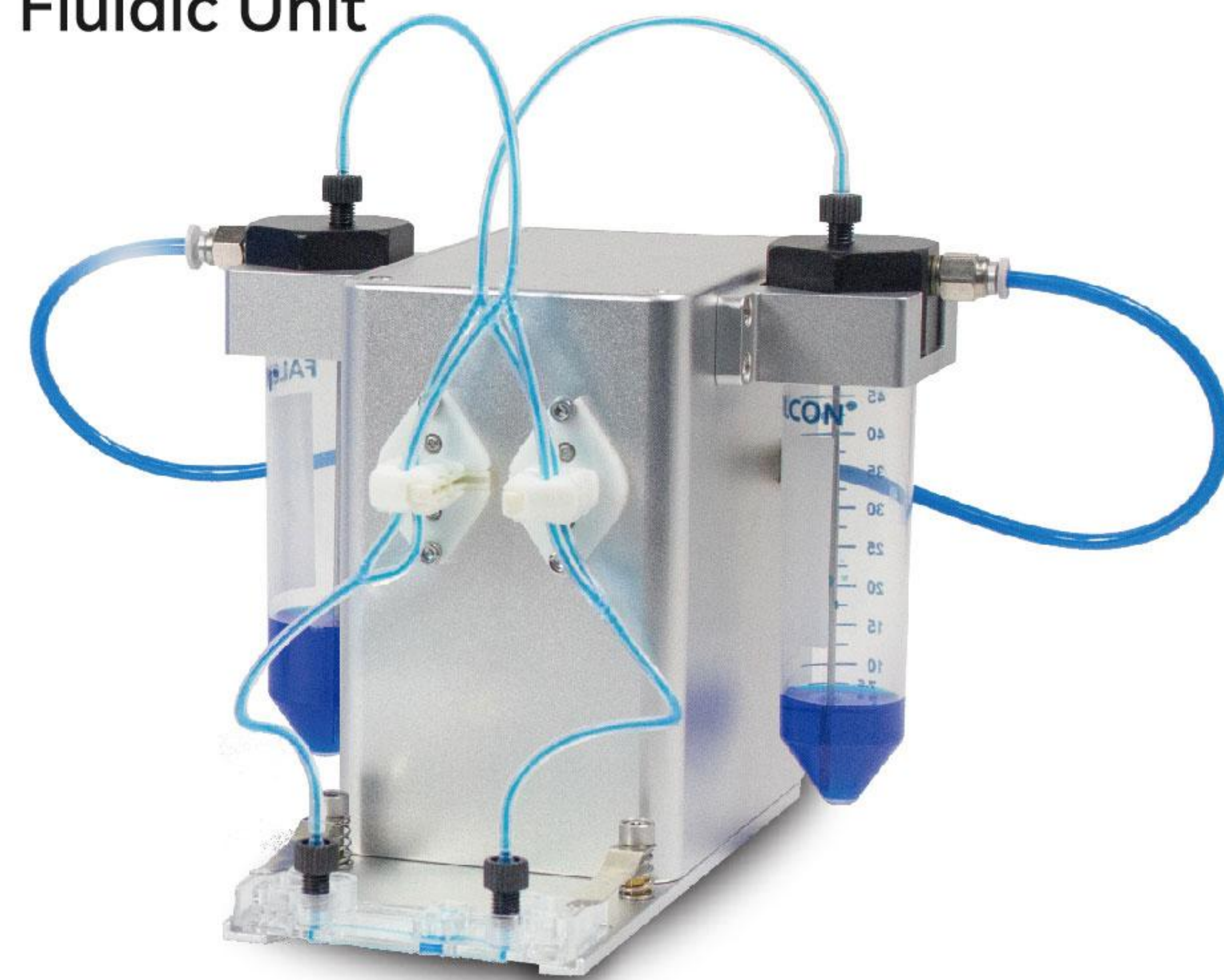
\*Be-Gradient culture model



## Control Unit



## Fluidic Unit



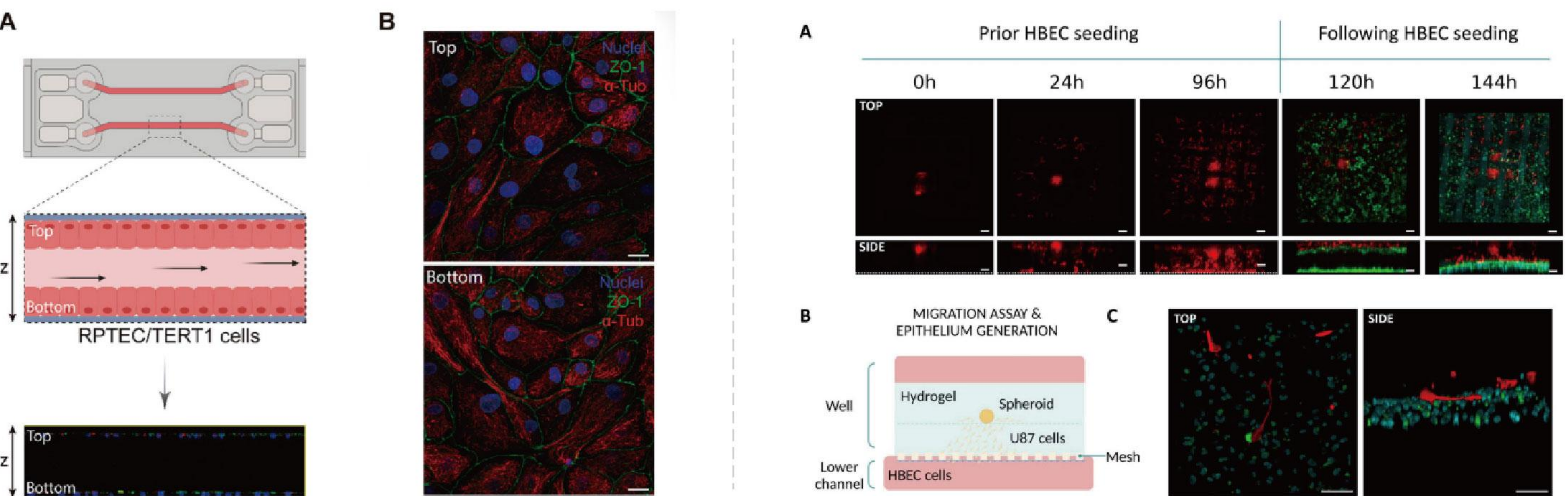


# Standard Chips and Application

## ■ 2D/3D Cell Culture

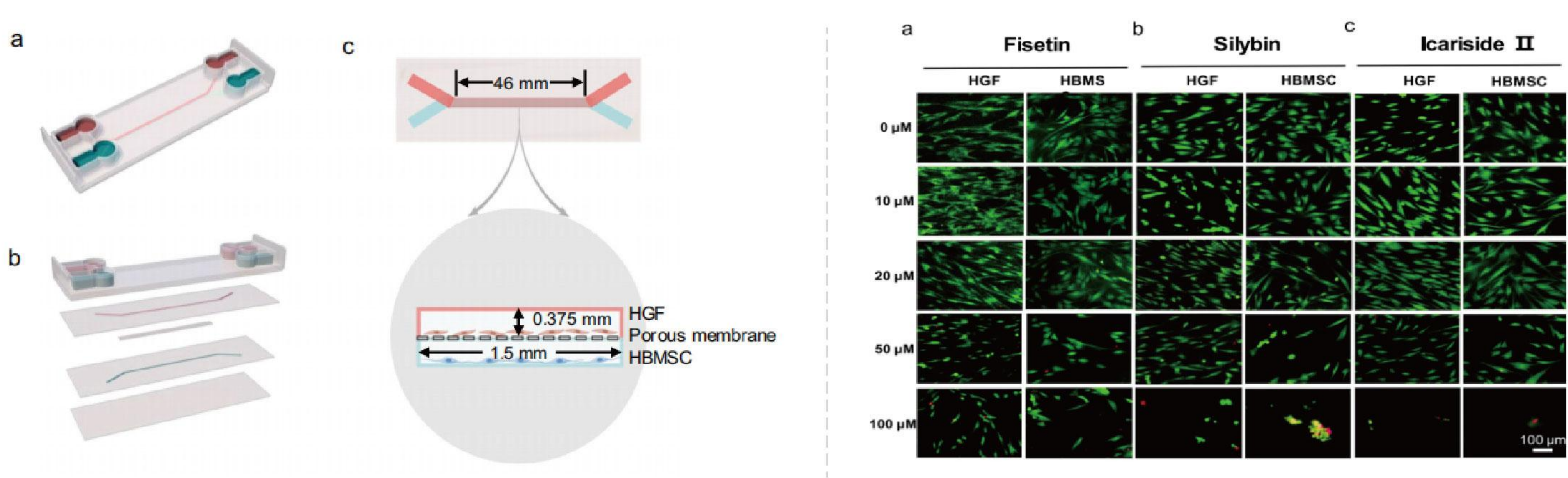
**Be-Flow culture model**, designed specifically for cell culture under dynamic perfusion conditions, enabling long-term culture in two independent channels.

**Be-Transflow culture model**, Connected by a porous membrane, the culture well and microfluidic channel enable investigation of complex co-culture configurations.



## ■ Recirculating Culture

**Be-Doubleflow culture model**, composed of two perfusable channels connected by a porous membrane. It is an ideal system for investigating circulating particles (e.g., immune cells, circulating tumor cells) and conducting bilateral co-culture studies of endothelial/epithelial barriers under hypoxic conditions.





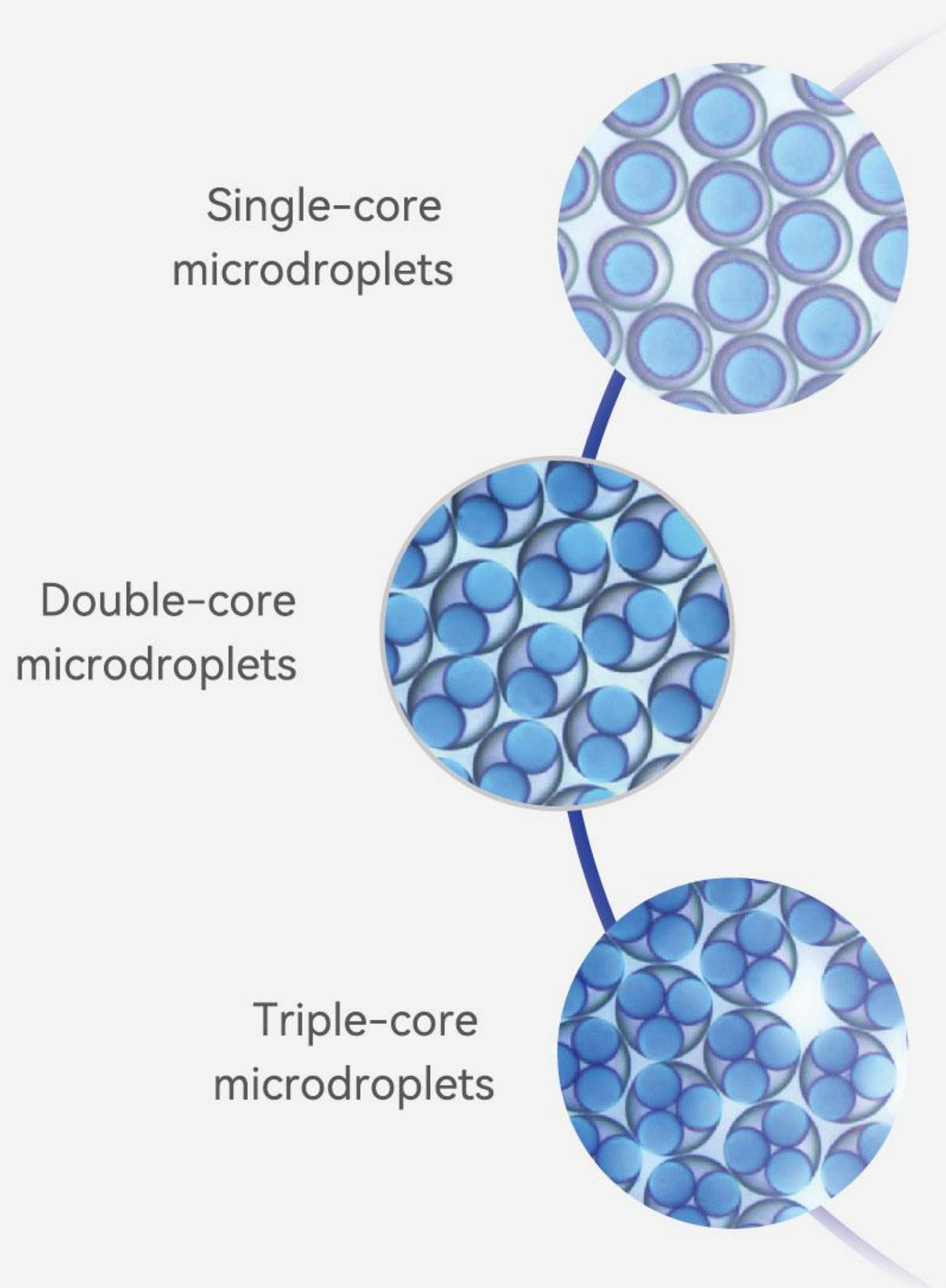
# DROPLET GENERATOR

The Droplet Generator (DG-01) is the most advanced microdroplets/microspheres preparation system. With the real-time monitoring of pressure and flow rate, the continuous phase and dispersed phase was injected into the FluidicLab standard microfluidic chip at a constant flow rate to generate high monodisperse microdroplets with a diameter of 25~300  $\mu\text{m}$ .

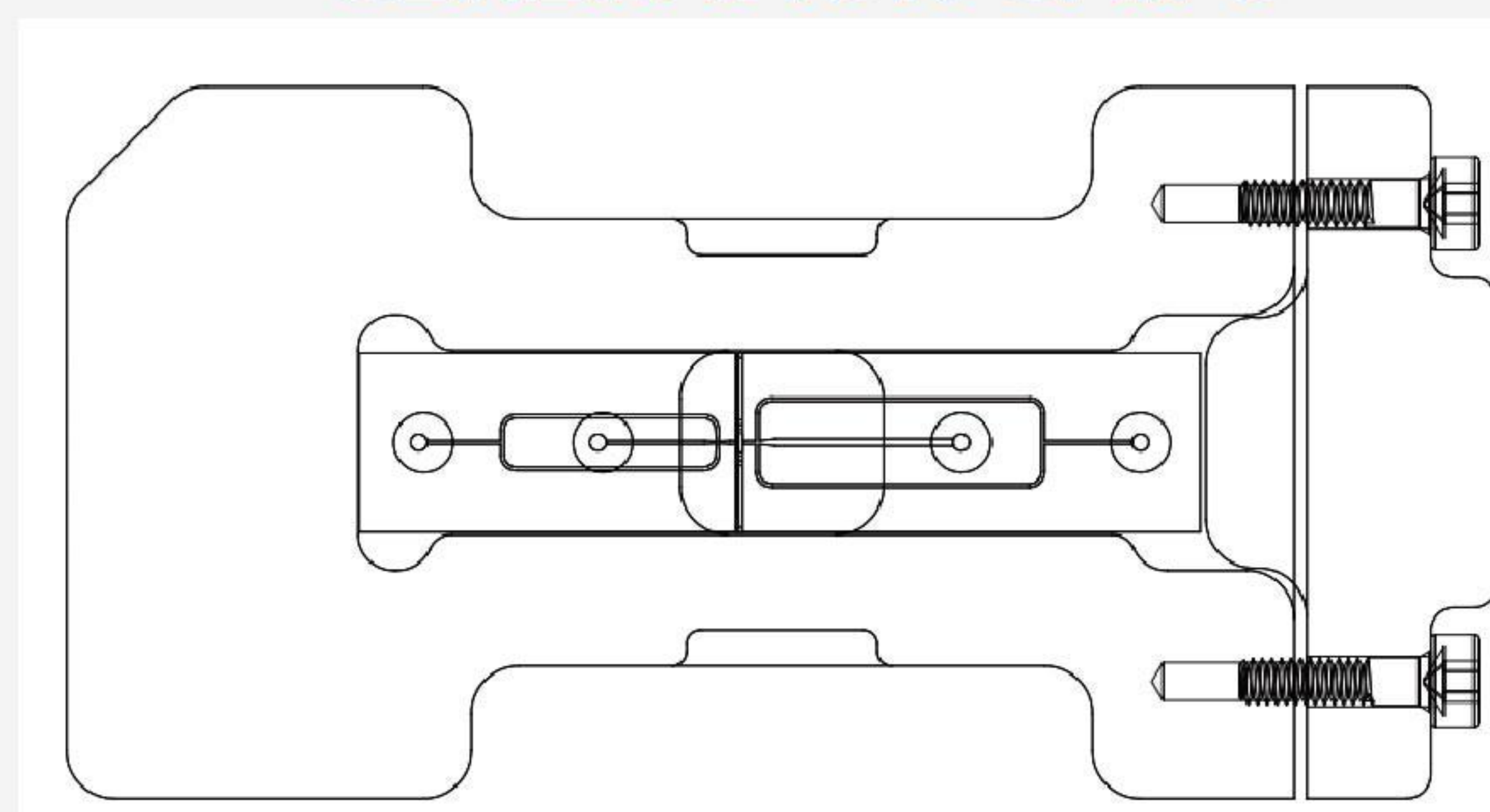


## Applications

The DG-01 can be used to prepare various microdroplets/microspheres with different microfluidic chips and reagents, which is widely used in a range of research fields including **single cell analysis**, **drugscreening**, **cell culture**, **regenerative medicine**, **synthetic biology** and **tissue engineering**. Learn more on our website <http://en.fluidiclab.com>.

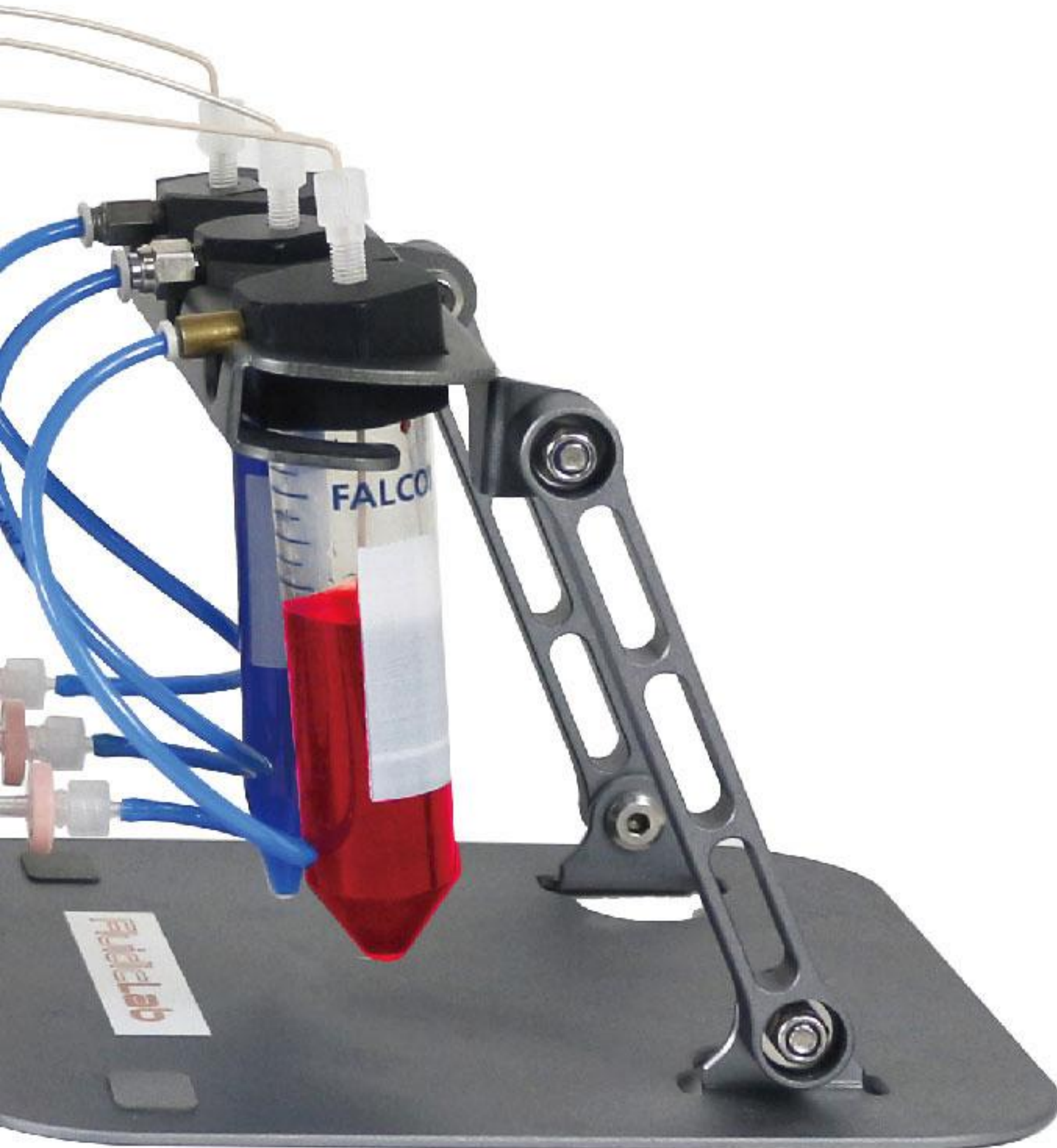


## MULTICORE MICRODROPLET GENERATION CHIPS



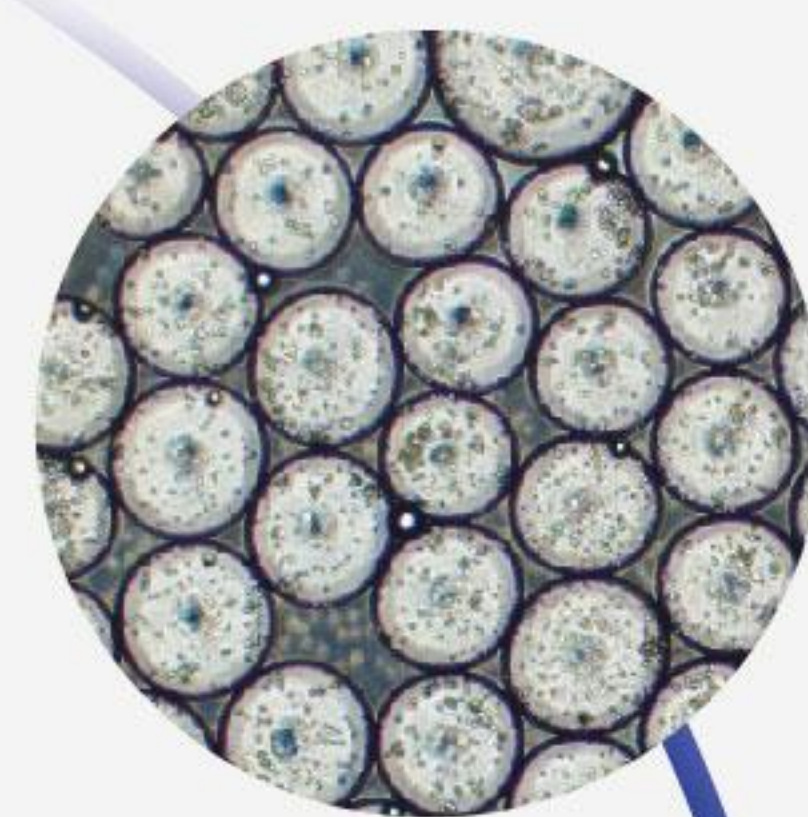
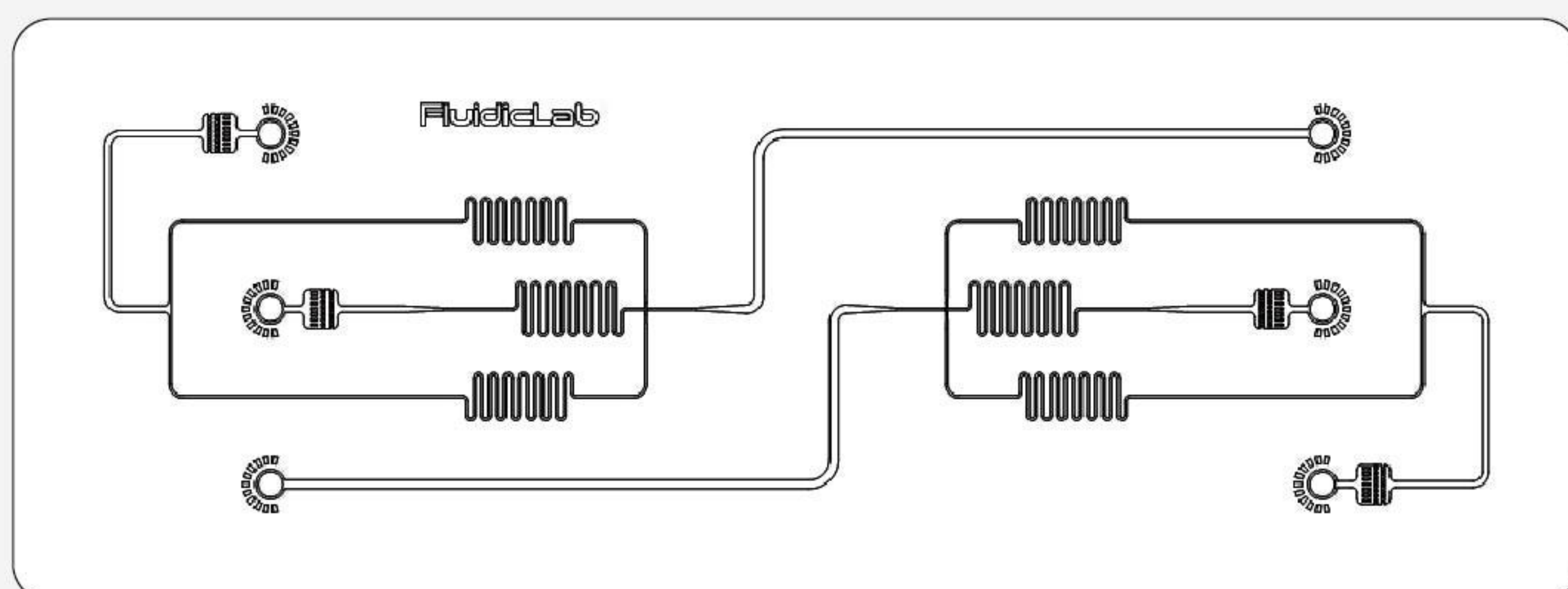


DG-01

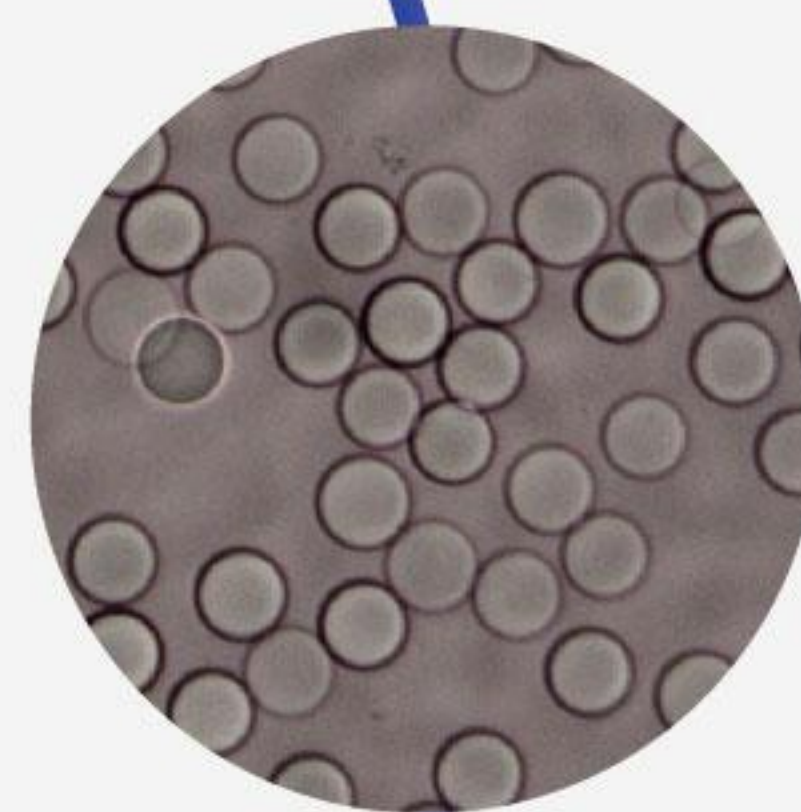


- High precision and responsiveness in pressure control
- High precision constant flow rate control
- Easy generation and reproducible of microdroplets
- Real-time observation of microdroplets generation
- User-friendly interface with effective data visualization
- Reagent kits and lab notes available

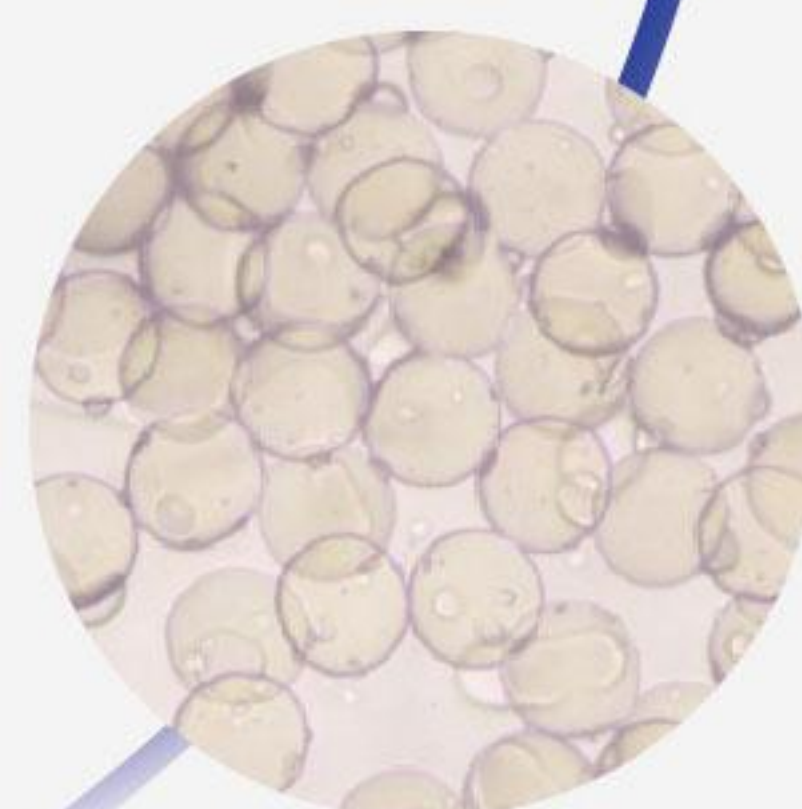
## PDMS FLOW FOCUSING CHIPS



Cell-laden GelMA-based hydrogels microspheres



Dissolvable beads for droplet DNA barcoding



Chitosan microspheres

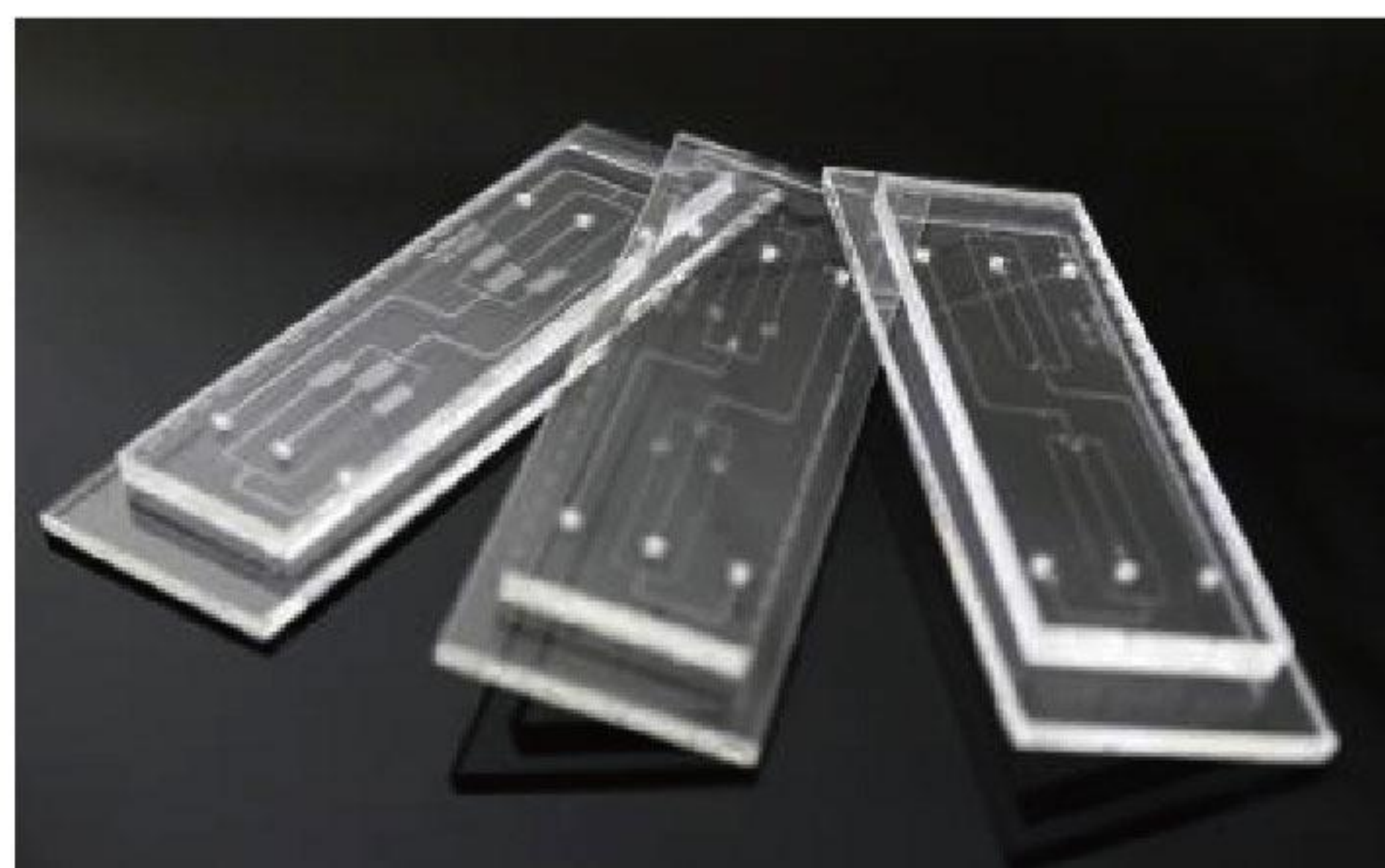


# MICROFLUIDIC CHIP

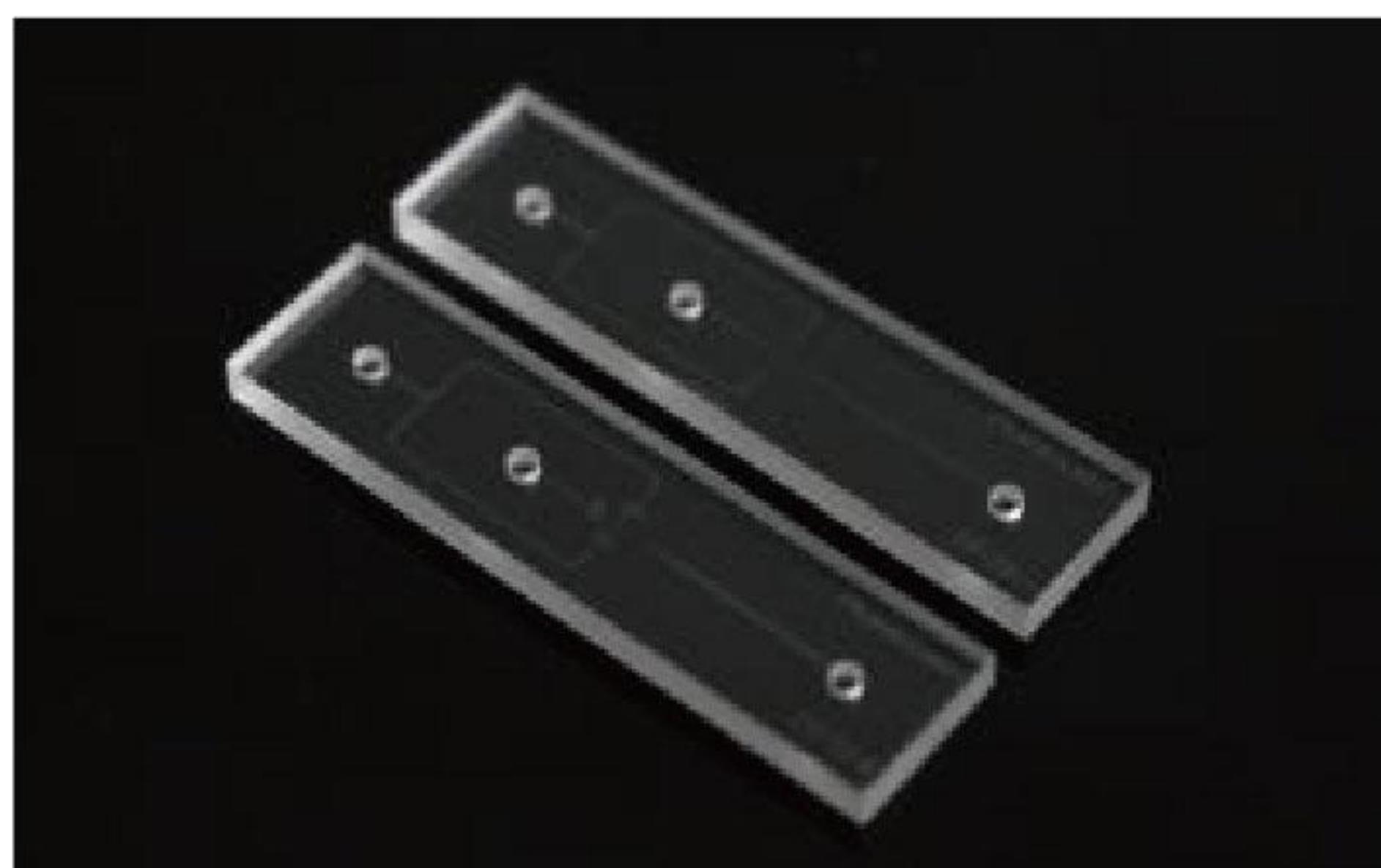
At FluidicLab, we develop and manufacture numerous different chips, flow cells and nozzles. We have the following range of products available: Droplet Generators, Micromixers, Flow Cells, Enhanced Oil Recovery (EOR) Chips, Organ-on-a-Chip and Basic Microfluidic Building Blocks. If this selection doesn't offer the specific chip you are looking for, please contact us!

## ■ Droplet generators

In conventional droplet generation units, the "Flow-Focusing" structure demonstrates greater stability during droplet formation compared to 'T'-shaped channel chips. We provide reusable droplet generators, which can be categorized into single-emulsion and double-emulsion chips.



PDMS flow focusing chips



Glass flow focusing chips



Multicore microdroplet generation chips

## ■ Micromixers

Our micromixers leverage the benefits of miniaturization to provide a controlled environment for chemical reactions, enabling applications in organic synthesis, nanoparticle production, polymerization, and process intensification across various industries like pharmaceuticals, fine chemicals, and materials science.



COC herringbone hybrid chip



Metal-glass microhybrid chips



Vortex Chips



## ■ Organ-on-a-Chip

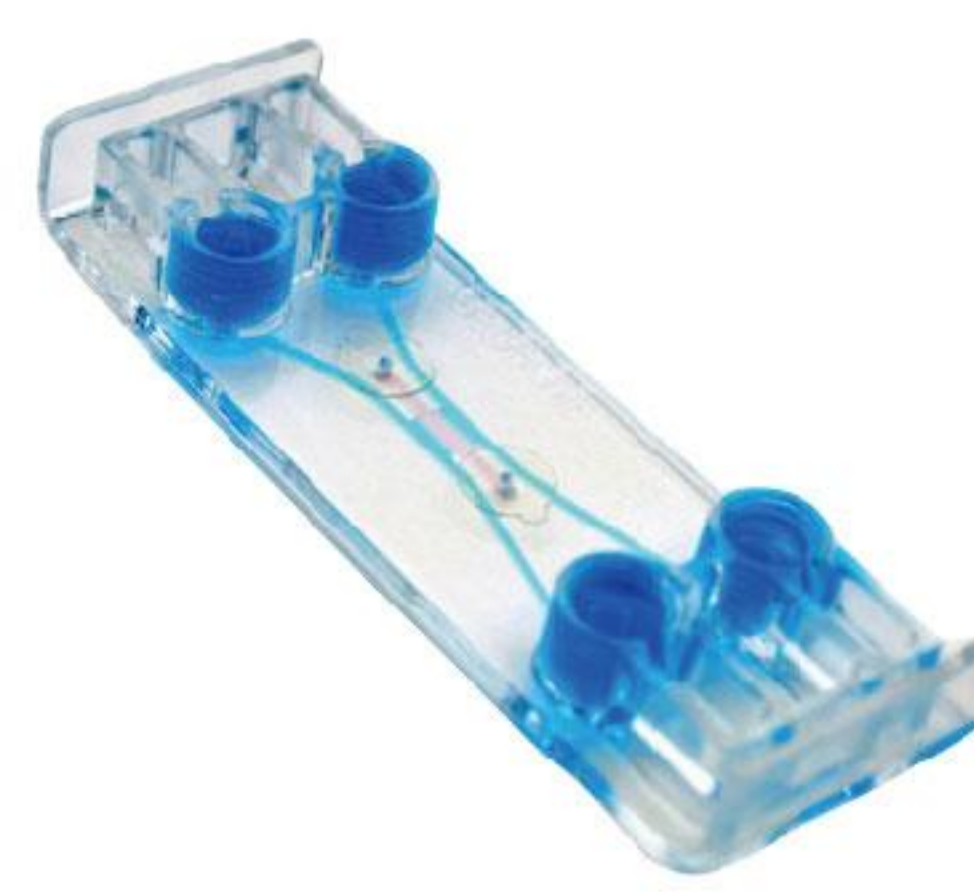
An organ-on-a-chip (OOC) is a microfluidic cell culture device designed to replicate the structure, functions, and physiological responses of an entire organ or organ system.



Be-Flow  
culture model



Be-Transflow  
culture model

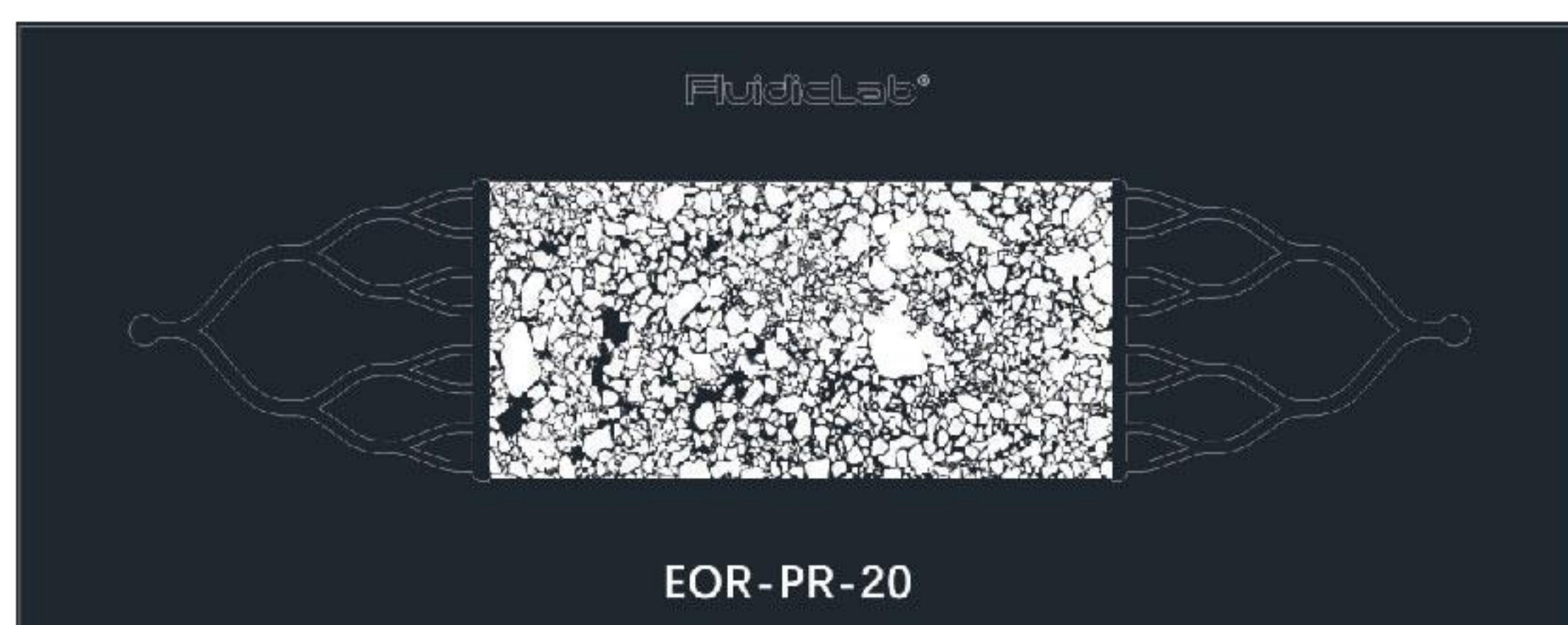


Be-Gradient  
culture model

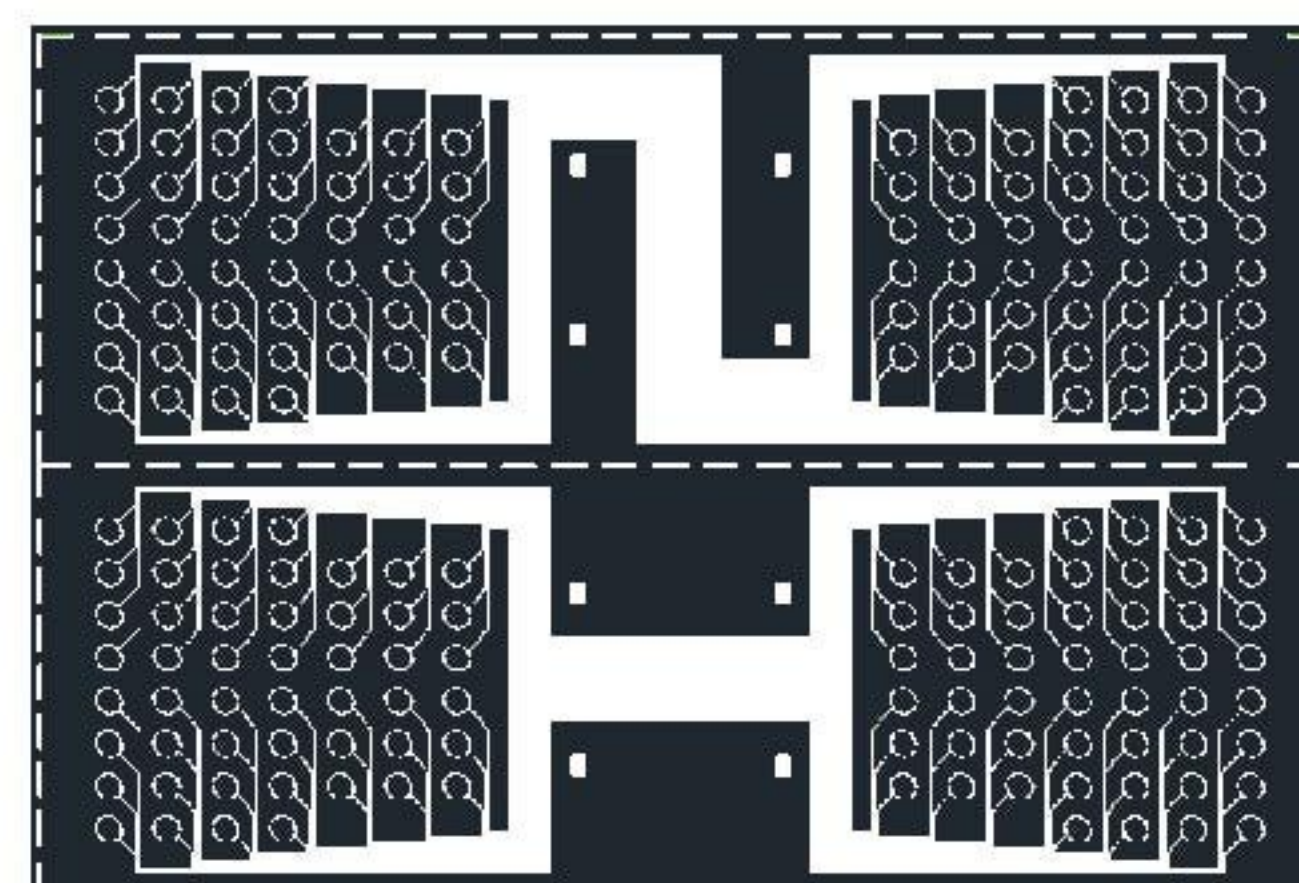


Be-Doubleflow  
culture model

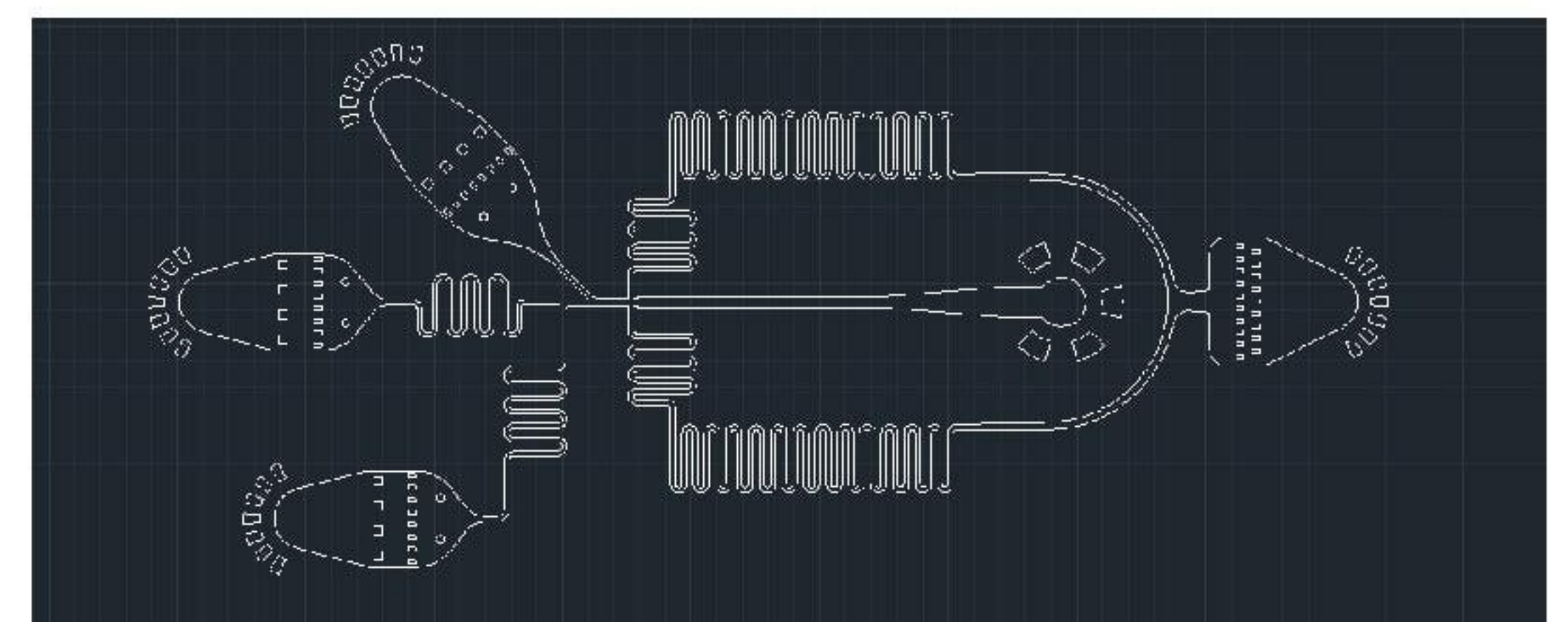
## ■ Other types of chips



Enhanced Oil Recovery (EOR) Chips

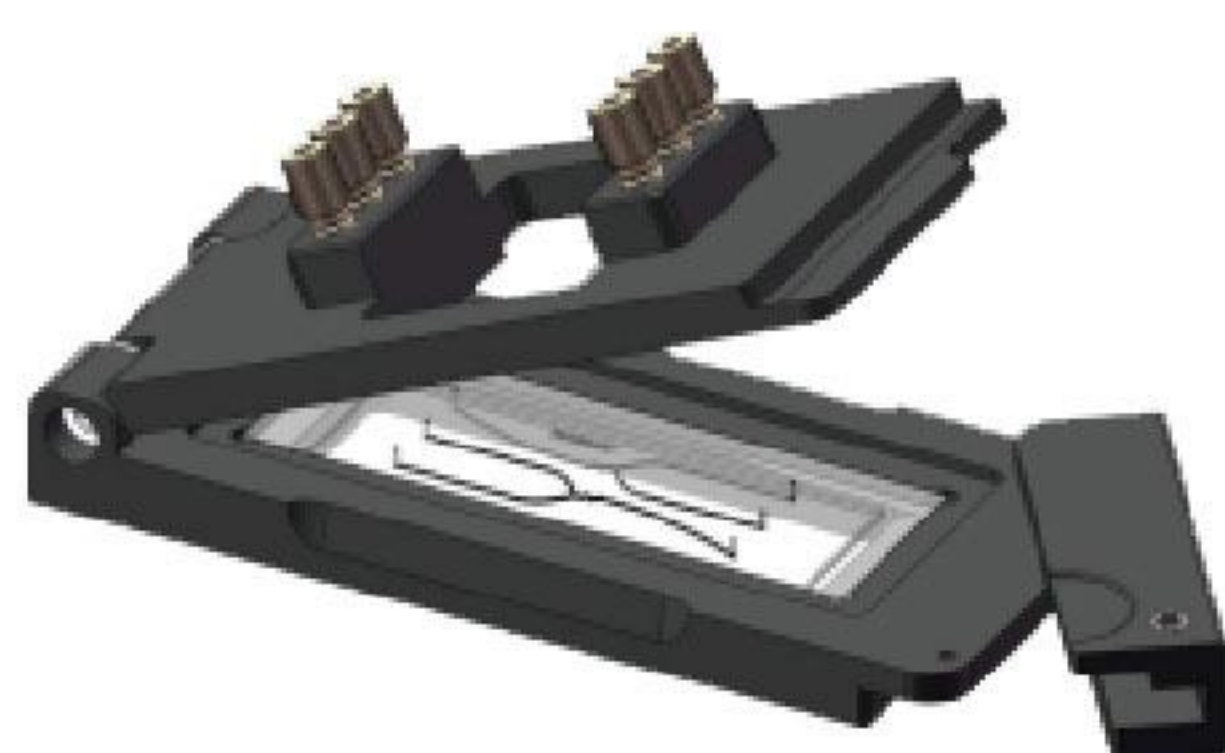


DBiT-seq Chips



Cell Barcoding Device

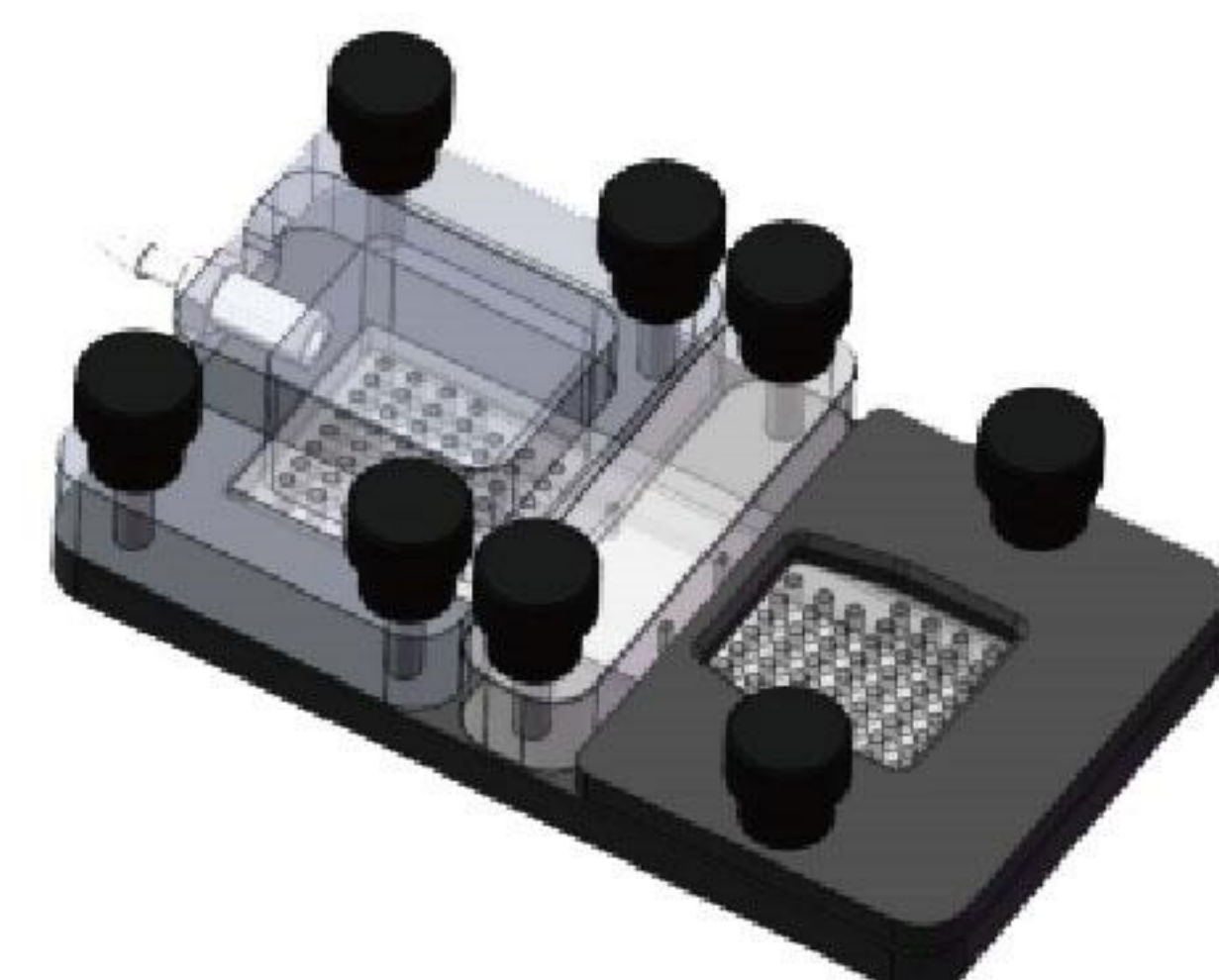
## ■ Chip Holders



PDMS Microdroplet Chip Holder



Glass Microdroplet Chip Holder



DBiT Chip Holder



# DROPLET GENERATION OIL

**Drop-Surf®** Droplet Generation Oil is designed for high stability and efficient production of water-in-oil droplets with a range of application (e.g. cell culture, molecular biologic detection, etc.).

Fluorinated oils, the base oil used in our product, have a range of advantages over mineral oils, including: lower viscosity, better PDMS compatibility, lower drop-to-drop organic compound transfer, good solubility for gases and better biocompatibility in long term.

- Good biocompatibility with HFE 7500 as base oil
- Stable droplet formation from 1  $\mu\text{m}$  up to 300  $\mu\text{m}$
- Outstanding droplet heat stability (Up to 95 °C)
- Suitable for long-term cell culture experiments
- Instant and direct use without any pretreatments
- High droplet generation frequency

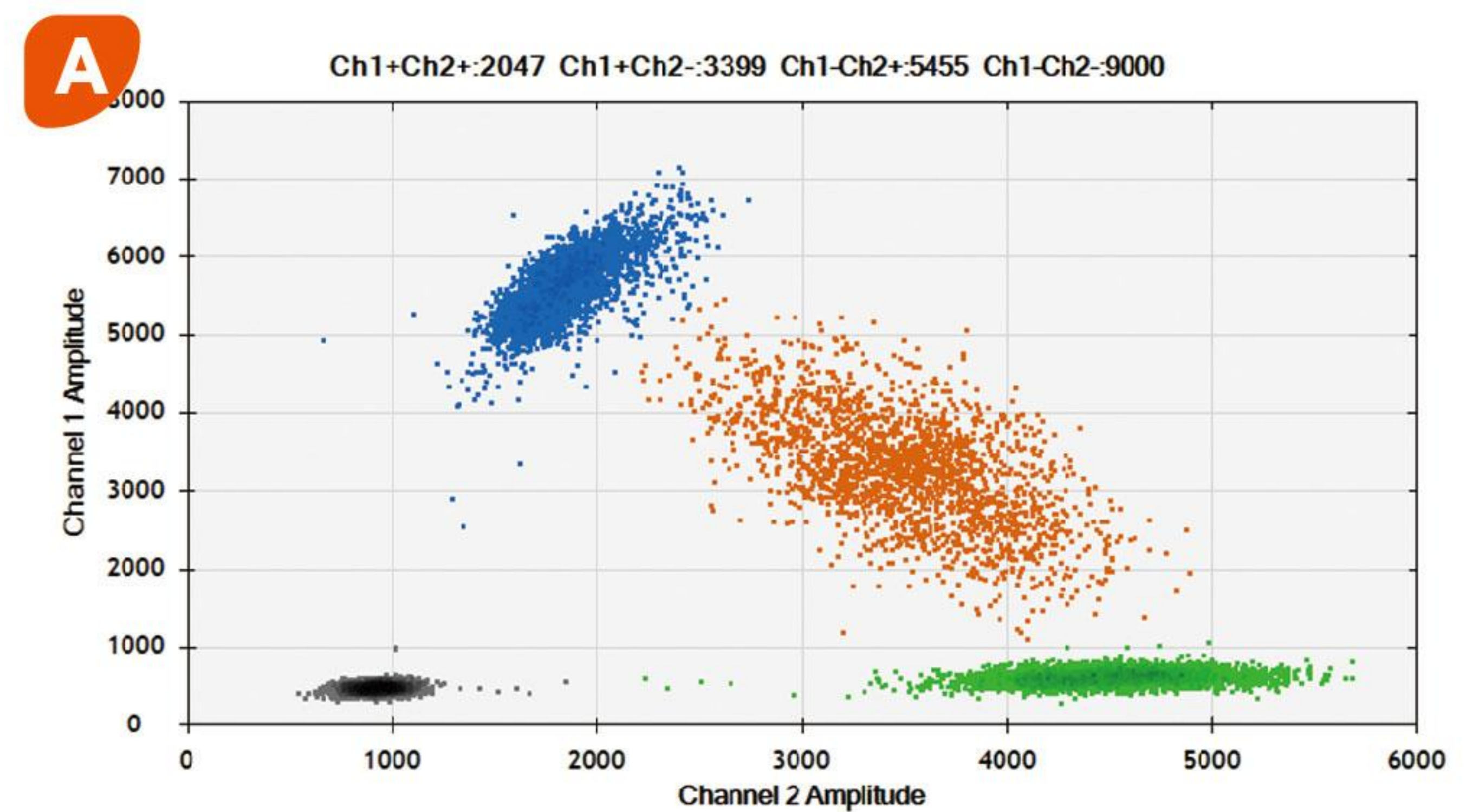




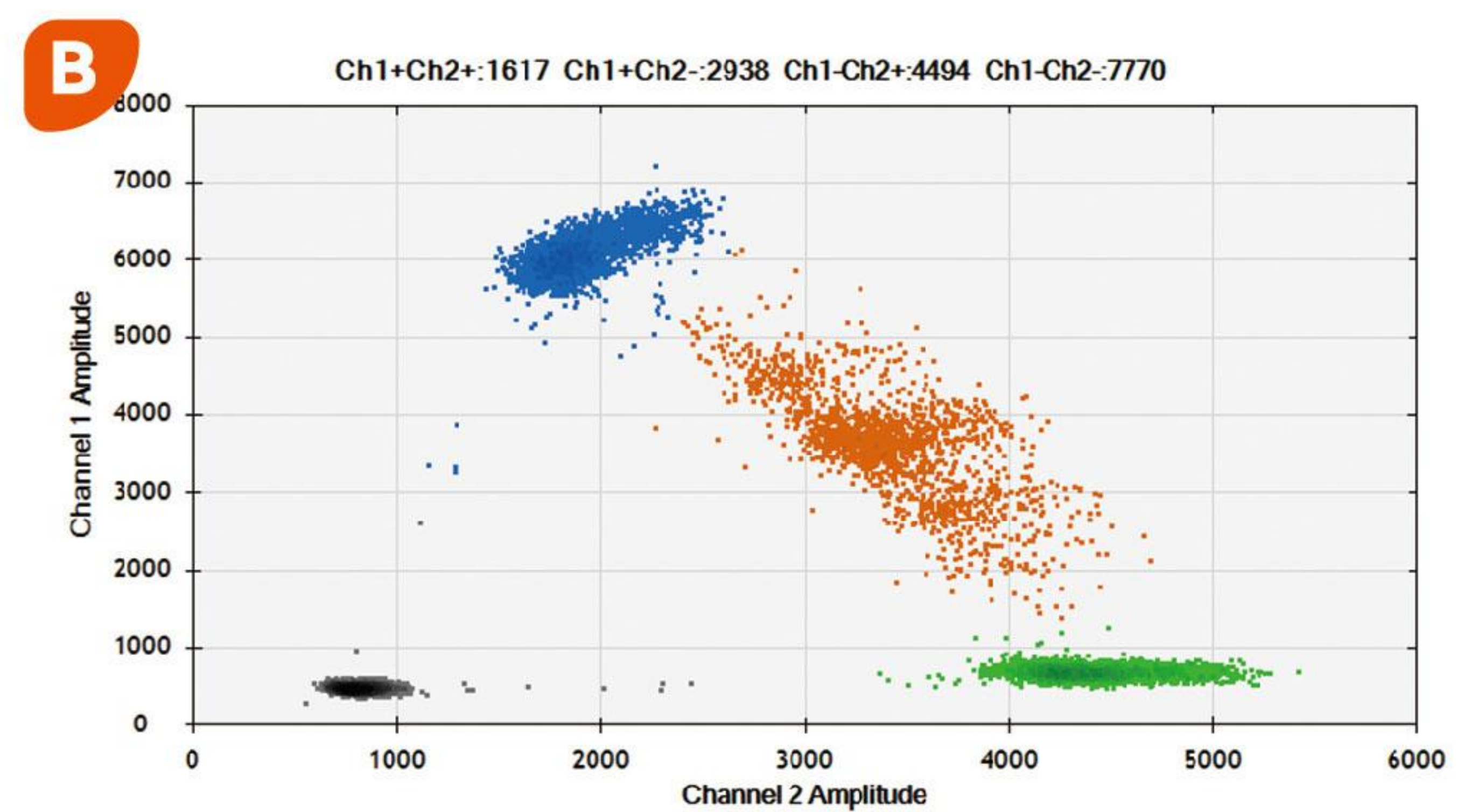
# Applications

## ddPCR ■

FluidicLab Drop-Surf® Droplet Generation Oil delivers comparable performance to leading commercial brands when used on ddPCR instruments, with no significant difference observed.



Droplet Generation Oil of commercial brands (1863005, 1864110)



Drop-Surf® 2% Droplet Generation Oil (DGO-20-02-05, DGO-20-02-10, DGO-20-02-50)

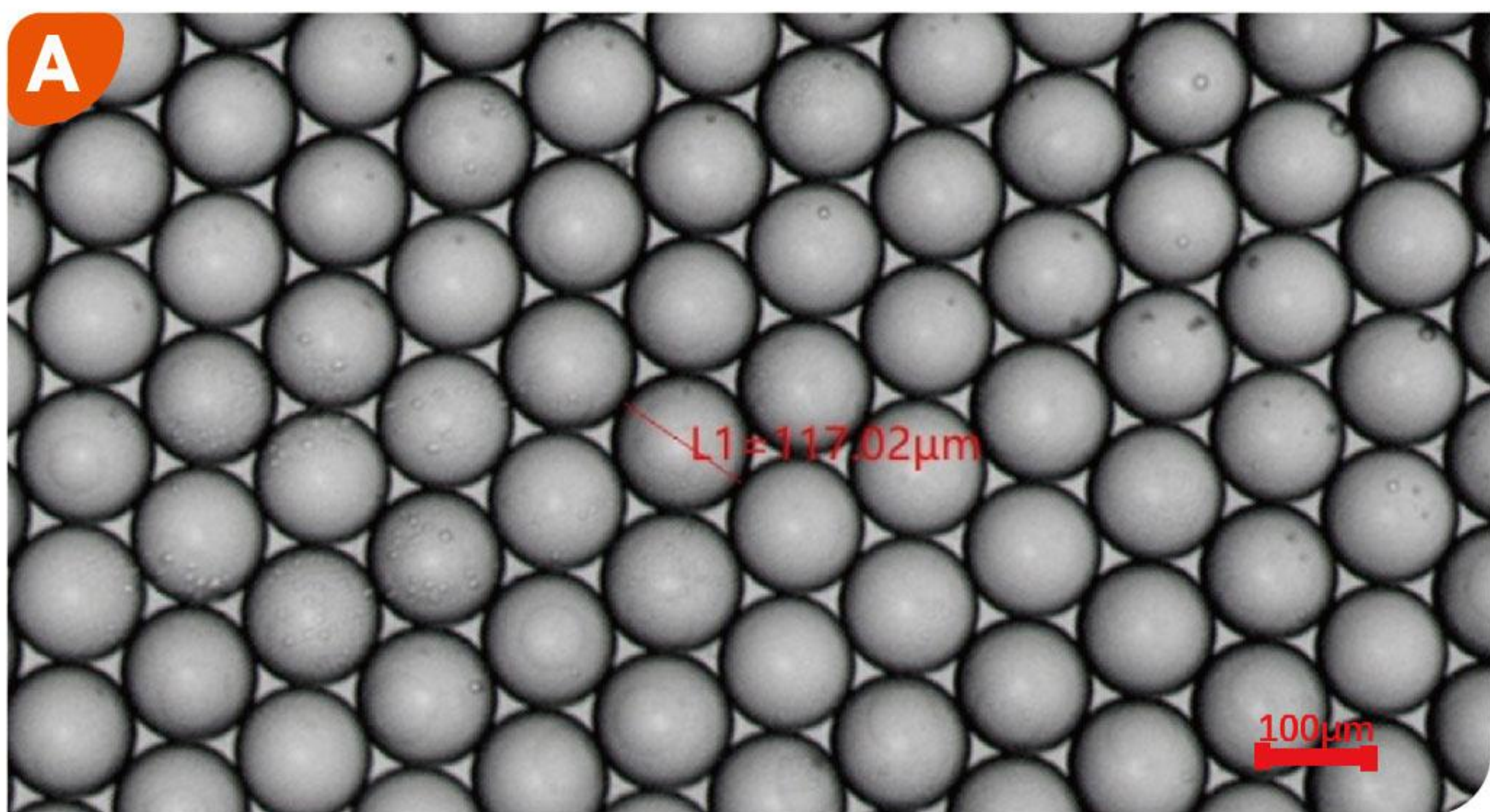


# Drop-Surf®

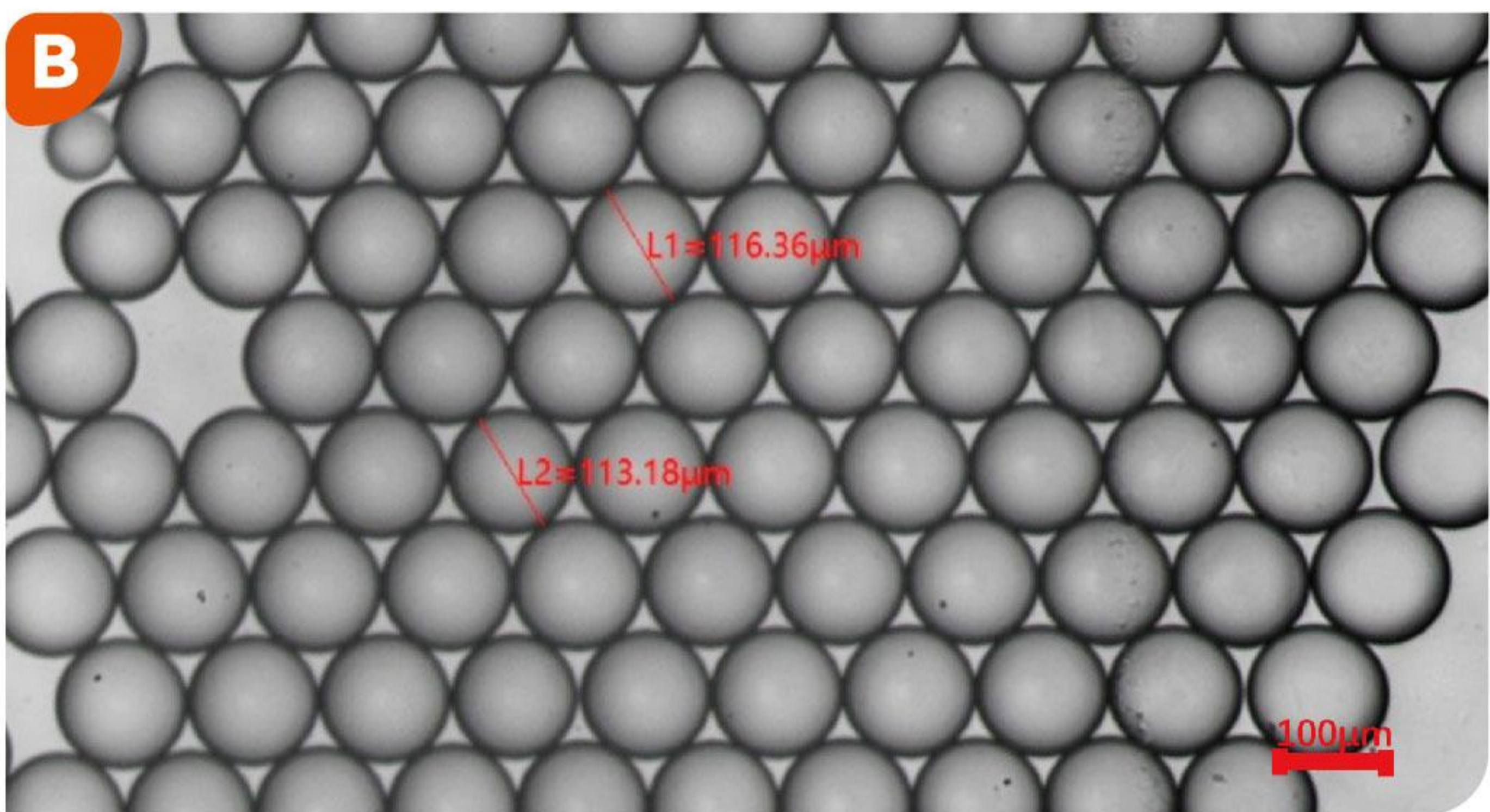


## ■ Single Cell Sequencing Library Preparation

- 1 FluidicLab Drop-Surf® Droplet Generation Oil enables the formation of uniform and stable single cell-barcode beads. After reverse transcription, the droplets remain consistent and intact, with no fusion observed.

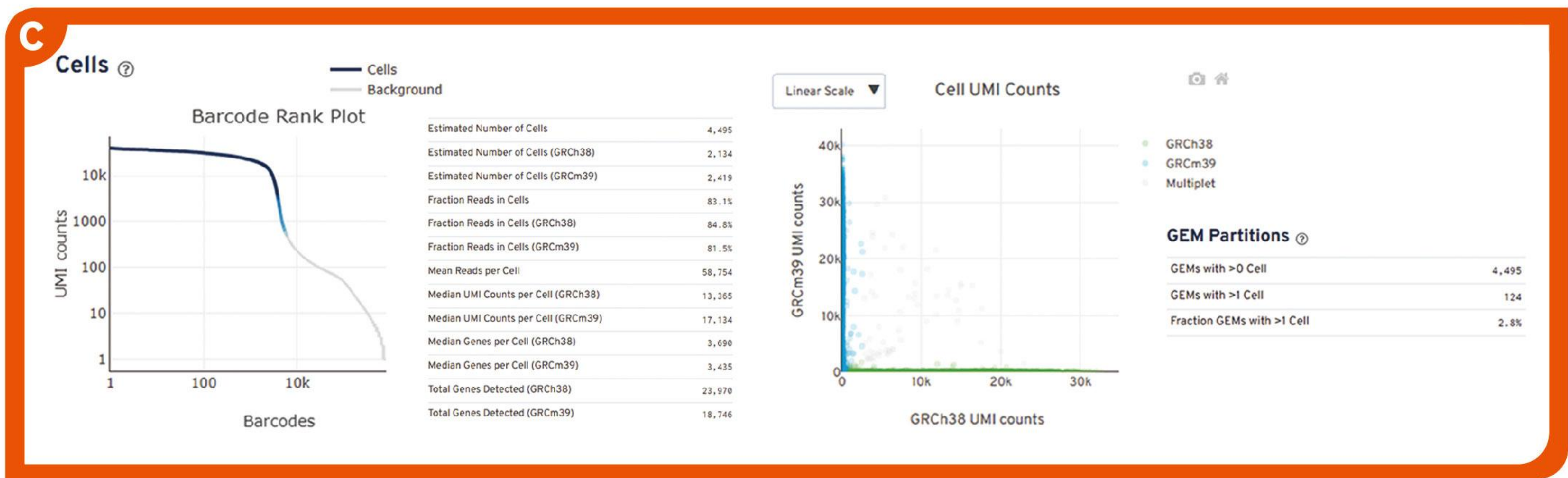


Drop-Surf® Droplet Generation Oil enables the formation of uniform and stable single cell-barcode beads.



After reverse transcription, single cell droplets encapsulate cell and barcoded beads.

- 2 Using FluidicLab Drop-Surf® Droplet Generation Oil for single-cell library preparation of mixed 293/3T3 cell lines resulted in excellent performance. Sequencing analysis showed high gene counts ( $\geq 3,500$  genes per cell) and outstanding singlet rates ( $\geq 97\%$ ).

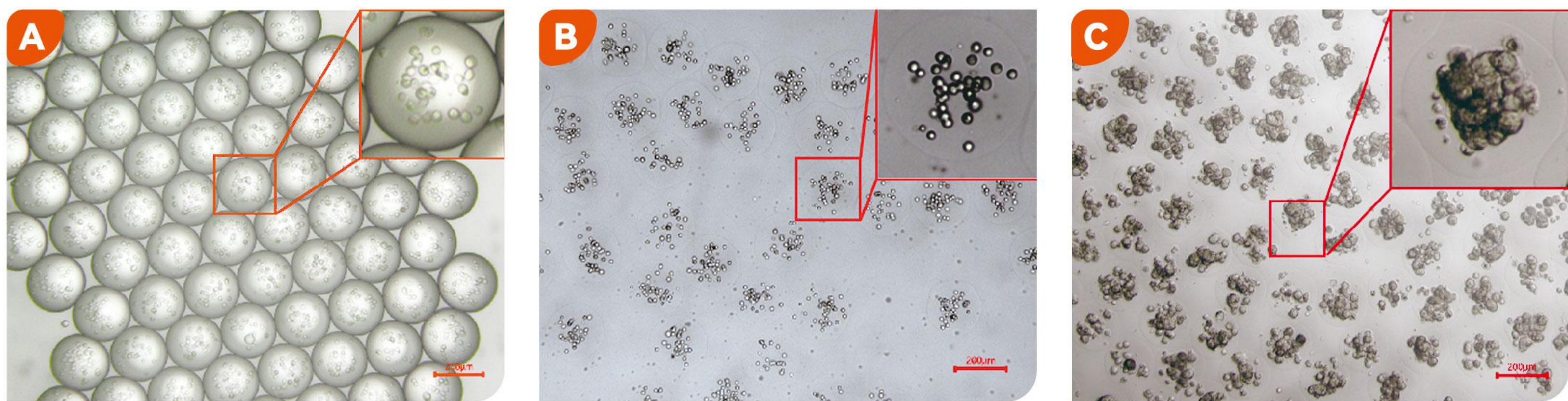


Results after replacing the partition oil in a commercial 3' transcriptome library preparation kit.



## ■ Hydrogel Beads and 3D Organoid Culture

Using FluidicLab Drop-Surf® Droplet Generation Oil generates alginate hydrogel beads encapsulating 293T cells. After 14 days of culture, the alginate structure remained intact, with 293T cells forming 3D spheroids while maintaining high cell viability.



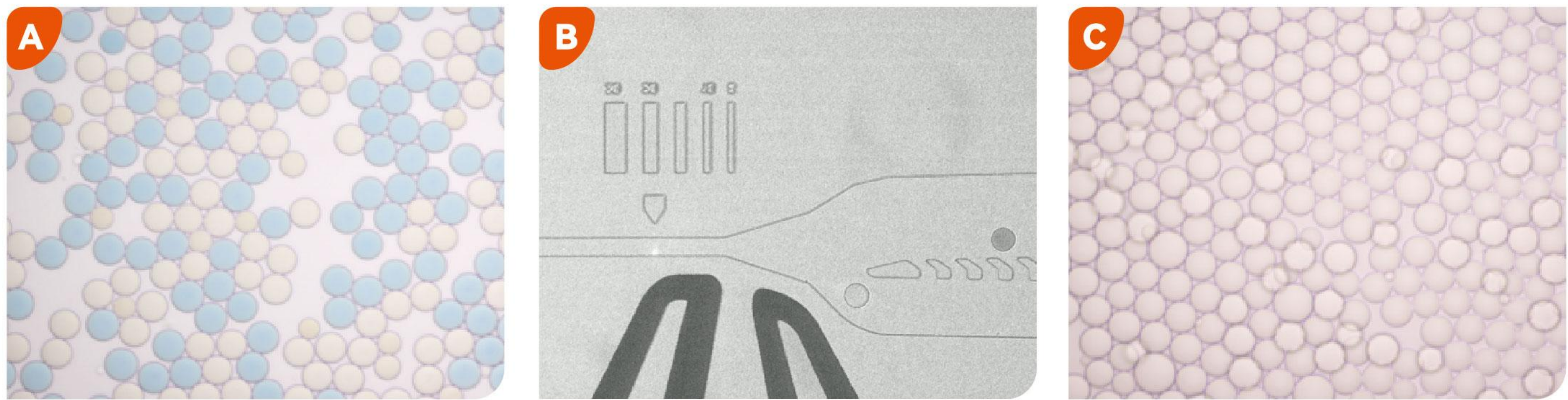
Drop-Surf® Droplet Generation Oil encapsulate alginate and 293T cells

After solidification

After 14 days of culturing

## ■ High-throughput Fluorescent Droplet Sorting

FluidicLab Drop-Surf® Droplet Generation Oil droplets generation and sorting: FITC (pale yellow, positive), ink (blue, negative). Following dielectrophoretic sorting, the droplets maintained structural integrity, and positive targets were effectively enriched ( $\geq 95\%$ ).



Before sorting




Dielectrophoretic sorting

After sorting



# DEMULSIFIER

**Drop-Surf®** Demulsifier is an emulsion breaker designed to break emulsions formed with Drop-Surf® Droplets Generation Oil. This particular reagent rapidly and thoroughly removes the surfactant to break the emulsion droplets, allowing the release of the droplet phase for further analyses and research.

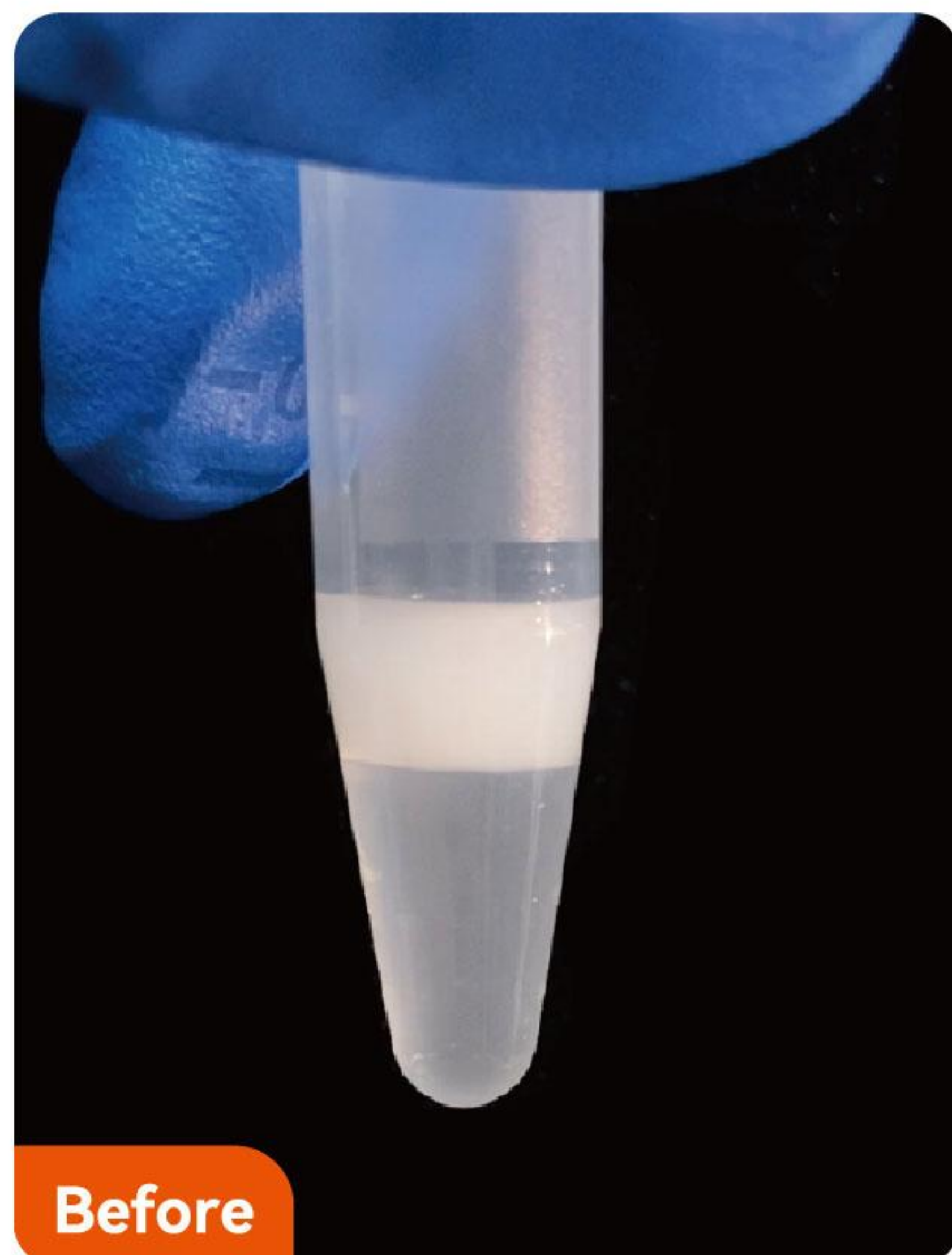
-  **High coalescence efficiency**
-  **Low loss of droplet contents**
-  **Instant and direct use**





# How to use Drop-Surf® Demulsifier?

- ❶ Remove the oil phase at the bottom of the collection container.
- ❷ Add 2x volume of Drop-Surf® Demulsifier to the droplets. For every 100 µL droplets, add 200 µL Drop-Surf® Demulsifier.
- ❸ Vortex the mixture for 20 seconds, then centrifuge for 30 seconds. Note that the centrifugal force should be no more than 1700 g. Remove Drop-Surf® Demulsifier at the bottom of the container.
- ❹ Repeat step 3, until all white droplets on the top of the container change into transparent.
- ❺ Finally, clean and disperse the droplets in water or an aqueous buffer solution.



Before the addition of the demulsifier, the upper layer appears milky white.



After the addition of the demulsifier, the upper layer appears transparent.

Drop-Surf®



Precision in Flow:  
Your Complete **Microfluidic** Ecosystem !

**Prinzen Biomedical Inc.**

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WhatsApp



Website