

# Temporal single-cell profiling on biopsies taken from living cells.

— Recording gene expression changes throughout the life time of a single cell.

**The specific cell chosen for analysis matters.** Tumor heterogeneity challenges highlight that similar cells behave differently throughout their life paths. High throughput single-cell technologies brought many advances to better understand this, but statistical averaging still limits detection of relevant rare cell trajectories.

Imagine being able to follow these dynamic, life path changes in living, single cells. With the FluidFM OMNIUM platform, **you can take picoliter biopsies to follow evolution of living cells over time.**

## Biopsies without compromising viability



Gentle, force-controlled extraction keeps your cell alive after taking a biopsy

## Live monitoring of single-cells



Take several biopsies of the same cell, while monitoring its development over time.

## Temporal gene expression profiling



Biopsies are snapshot representations of a cell's transcriptome that can be analyzed downstream.

## What can you do with single-cell biopsies?

- Transcriptome recordings prior to phenotyping
- Sequential transcriptome readouts from the same cell

Immuno-oncology

Developmental biology

Epigenetics

Cellular reprogramming



## FluidFM® OMNIUM system for sub-cellular biopsies

The FluidFM® OMNIUM is a standalone, easy-to-use, automated system with streamlined workflows for single-cell biopsy collection. The force-controlled micro-channelled probes enable highly gentle penetration of the cell membranes resulting in minimal cell perturbations and high viability. This allows you to extract and isolate sub-picoliter volumes from a living single cell for further analysis.



**Gentle, force-controlled Nanosyringes to preserve cell viability**



**Streamlined biopsy workflows and customized kit for biopsy collection**



**CO<sub>2</sub> and temperature control** (incubator not shown)



**Integrated inverted microscope for visual control and observation of cells**



**Compatible with standard cell culture containers**

## What have biopsies been used for?



W. Chen et al. Live-seq enables temporal transcriptomic recordings of single cells (2022) *Nature*, 608, 733-740

Live-seq is an approach for single-cell transcriptome profiling that preserves cell viability during RNA extraction using FluidFM.

- 85% to 89% cell viability was preserved after taking a biopsy with an average extraction volume of 1.1 pL
- no major perturbations were observed compared to lysed cell transcriptomes.
- This approach shows the feasibility to couple a cell's ground-state transcriptome to its downstream molecular or phenotypic behaviour.



O. Guillaume-Gentil et al. Tunable Single-Cell Extraction for Molecular Analysis (2016) *Cell*, 166 (2), 506-516

Single HeLa cells can be extracted by exerting underpressure through a custom FluidFM probe.

- Extracted volumes could be estimated based on geometrical parameters of the probes and optical monitoring during suction of the cellular content.
- Volumes up to 4pL could be extracted from HeLa cells with 82% viability rate. Maximum (median) extraction volume was estimated at 4.4pL.

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