Polaris

Imagine an experiment where you can measure each T cell's responses to vaccination, compare different candidates and monitor their response to viral infection. Think of the pathways you could uncover if you could isolate a single neuron and recreate the triggers that cause neurodegeneration. What if you could monitor changes in a cancer stem cell's gene expression after chemotherapy to determine which cells are most responsive? With Polaris™, you can design and execute the experiments you have always dreamed of. You can select the target cells you want to study, simulate their physiological conditions, dose each cell under strict environmental control and then immediately prepare individual cells for whole transcriptome analysis.

Features

- Obtain >90% purity of sample by actively selecting and isolating cells of interest.
- Embed an extracellular matrix for structural and biochemical support of captured cells.
- Easily prepare individual cells for mRNA sequencing analysis to reveal changes in expression.
- Challenge cells with a wide range of factors, including RNA, transcription factors, viruses, small molecules and more.
- Control the cell’s environment, including temperature, gas levels, humidity, dosage and exposure.
- Reduce hands-on time by maintaining and feeding cells automatically throughout an experiment.
- Image live cells during processing to confirm cell health and phenotype.Design entire experiments with ease using the simple touchscreen interface for easy workflow management.

Applications

Cancer Research

- Determine which cell populations contribute to tumor development and growth.
- Understand what drives cells to metastasize into circulating tumor cells (CTCs).
- Evaluate the effect of immunotherapy on cancer cells.

Neuroscience

- Explore the mechanisms that drive neural differentiation and development.
- Define the conditions that initiate neurodegeneration.
- Measure neuronal response to pain stimuli.
- Investigate the interactions between different types of neurons.

Immunology

- Identify which cells and signals induce inflammatory response.
- Explore cellular response to viral infection.
- Investigate immune tolerance to self-antigens.
- Evaluate the efficacy of antibody therapy in inflammation or cell count.

Workflow

Select	Simulate environment	Perturb	Image	Measure
Select target cells based on immunophenotype	Re-create the cell's micro-environment	Challenge cells through precise dosing	Correlate imaging data with gene expression	Prepare for gene expression measurement

System FAQs

What single-cell applications are available on Polaris?

mRNA sequencing is the first application enabled on Polaris. The system can support a broad range of methods and applications that will be enabled over time through system upgrades and new IFC architectures.

How does Polaris differ from C1™?

C1 and Polaris are ideal tools for any laboratory. C1 is the ideal solution for surveying cellular heterogeneity and identifying unique and interesting cell populations. Polaris is perfect for investigating how targeted cell populations respond to stimuli and changes in their micro-environment.

How rare a population can I select on Polaris?

Polaris can capture 48 cells from a population that is present in as low as 1% of the starting cell sample. Polaris is compatible with many upstream enrichment methods to achieve an enrichment of low-abundance cell types to the 1% threshold required by Polaris.

What dyes or stains can I use for selection?

Polaris contains the following excitation and emission filters:

Filter	Excitation (center-width, in nm)	Emission (center-width, in nm)
TagCFP™	438-28	488-30
FAM™	475-39	525-25
VIC®	530-16	570-30
ROX™	575-30	630-30
CY5®	632-28	700-30

How many dyes or stains can I use for selection?

You can use up to four color channels to select cells on the Polaris system.

What's the longest I can keep my cells viable inside the Polaris instrument?

You can maintain and treat cells on the Polaris instrument for up to 24 hours before performing reverse transcription and cDNA amplification. The instrument will control temperature, gas composition and humidity.

How many cells can I capture in a Polaris IFC?

You can capture 48 single cells on the Polaris system.

How many reagents can I treat cells with on Polaris?

Cells on Polaris IFCs are organized into six groups of eight single cells each. Each of the six groups can be treated with a unique reagent for a total of six different reagents (one per group) on each IFC.

How long can I treat cells on the IFC?

Each chamber can be exposed for up to 24 hours, in two-hour increments.

How long does it take to select and capture the cells?

The time required for cell selection is approximately two to three hours for populations presenting at 1% of the starting sample. For populations higher than 1%, times are drastically reduced.

Specifications

Polaris system		
Thermal control	Peltier-based, ranging from 4 °C to 99 °C Max heating rate: >4 °C/sec Max cooling rate: >3 °C/sec	
IFC compatibility	Polaris Single-Cell mRNA Seq IFC	
Weight	Crated for shipment: 300 lb (136 kg) Uncrated: 242 lb (110 kg)	
Dimensions (approximate)	Crated: W 28.6 in. x D 37.3 in. x H 42.0 in. (72.7 cm x 94.8 cm x 106.8 cm)	Unpacked: W 20.6 in. x D 34.1 in. x H 27.8 in. (52.2 cm x 86.6 cm x 70.6 cm)
Current	10 A (max)	
Voltage	90 V (min) to 240 V (max)	
Frequency	50/60 Hz	
Connections	4x USB 2.0	
Humidity	30%–80%, noncondensing	

Work environment (indoor use only)	
Clearance	6 in. (15 cm) from the rear
Temperature	59 °F to 82 °F (15 °C to 28 °C) stable
Altitude	<8,202 ft (2,500 m)
Main supply fluctuation	Not to exceed ±10% of the nominal supply voltage

Learn more

For more information about Fluidigm applications for single-cell genomics and Polaris, visit fluidigm.com/polaris.

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