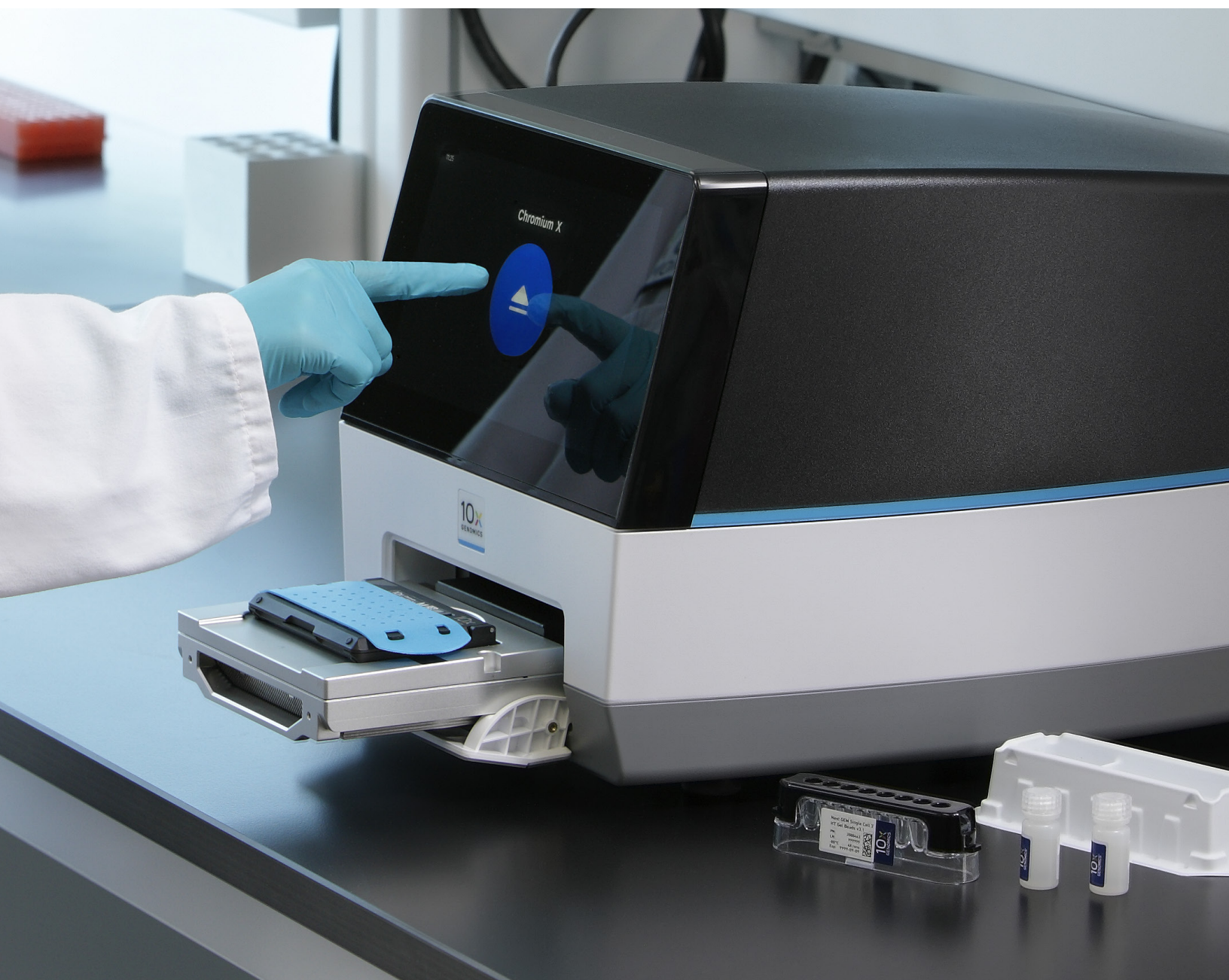




Inside Chromium Next GEM Technology





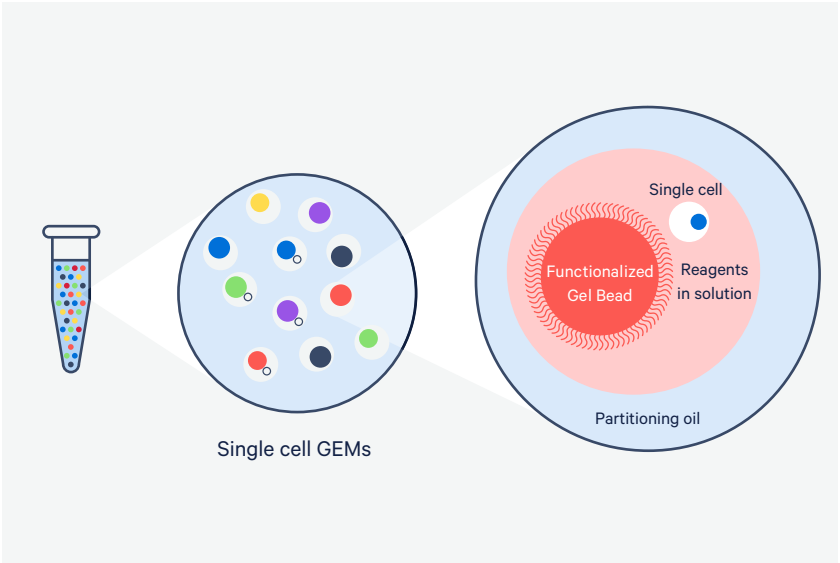
Resolving biology with scalable, single cell multiomic solutions

The Chromium platform, powered by Next GEM Technology, enables integrated analysis of single cells at massive scale. Our suite of Chromium Single Cell products can capture molecular readouts of cell activity in multiple dimensions, including gene expression, chromatin accessibility, cell surface proteins, immune clonotype, antigen specificity, and CRISPR edits. The key to this technology is the ability to generate tens of thousands of single cell partitions, each containing an identifying barcode for downstream analysis. The Chromium family of instruments uses advanced microfluidics to perform single cell partitioning and barcoding in a matter of minutes.

The core of Next GEM Technology

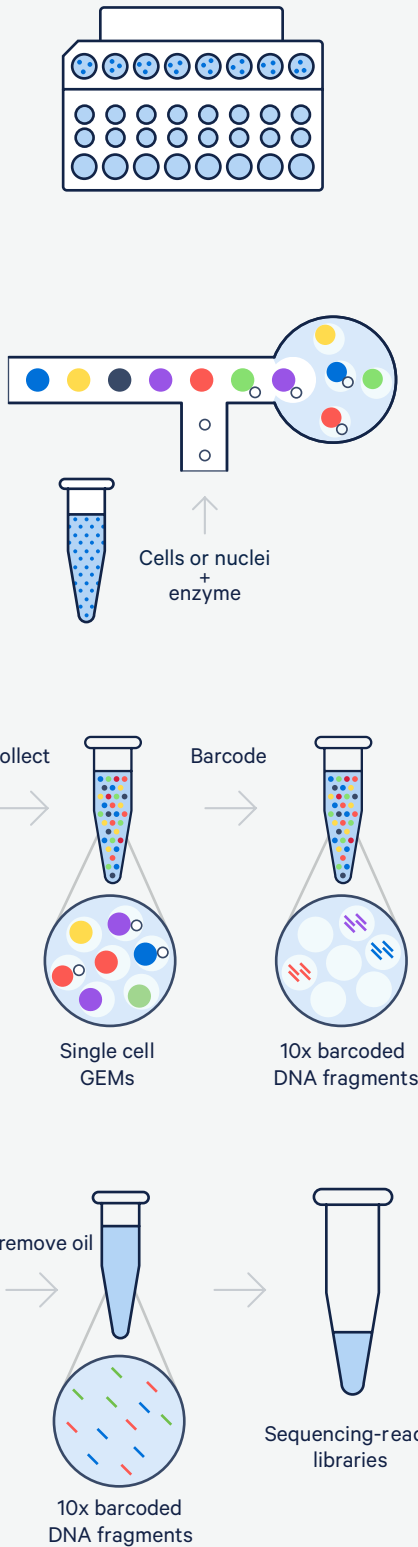
At the core of Next GEM Technology are Gel Beads, each one coated with a unique oligonucleotide barcode sequence and assay-specific functionalized sequences to capture molecules of interest.

Using advanced microfluidics, Chromium instruments encapsulate Gel Beads in GEMs, or a “Gel Bead-in-emulsion,” along with a single cell or nucleus and reagents to create a micro-reaction.



How it works: From cells and nuclei to sequencing-ready libraries

- 1 Gel Beads, cells or nuclei, enzymes, and partitioning oil are loaded onto a Next GEM chip.
- 2 Within the Chromium instrument, barcoded Gel Beads are mixed with the cells or nuclei, enzymes, and partitioning oil to form tens of thousands of GEMs.
- 3 Each GEM acts as an individual reaction droplet in which the Gel Beads are dissolved and molecules of interest from each cell are captured and barcoded.
- 4 After barcoding, all fragments from the same cell or nucleus share a common 10x Barcode. Barcoded fragments for hundreds to tens of thousands of cells are pooled for downstream reactions to create short-read sequencer-compatible libraries.

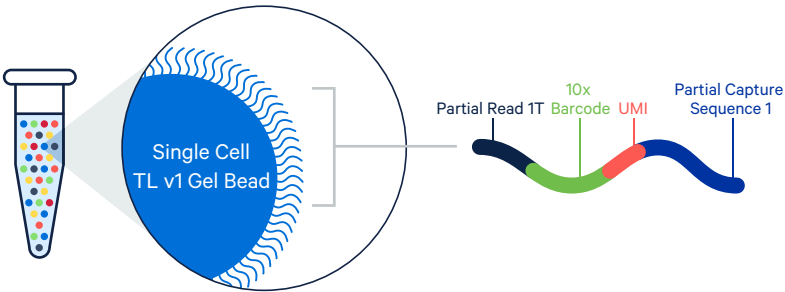


Chromium assays

Single Cell Gene Expression Flex

Single Cell Gene Expression Flex provides single cell whole transcriptome gene expression and multiplexing capabilities to profile hundreds to a million cells. The proprietary probe-based chemistry enables compatibility with both PFA-fixed and formalin-fixed, paraffin-embedded (FFPE) samples, providing ultimate flexibility and our highest sensitivity.

Assay input: Fresh or fixed cells or nuclei from human or mouse



Prior to running on the Chromium X/iX instrument, barcoded probes are bound to gene targets in pairs. Within the instrument, functionalized sequences on the Gel Bead enable capture of ligated probes alone or in combination with Feature Barcode-labeled antibodies for cell surface protein analysis.

Enabling single cell multiomics:
What is Feature Barcode technology?

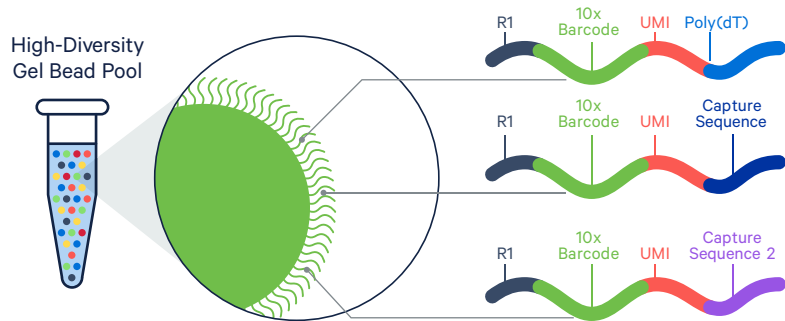
While Next GEM Technology enables single cell analysis, Feature Barcode sequences expand the breadth of analytes that can be captured at single cell resolution. Feature Barcode oligonucleotides have barcode sequences that label antibodies, CRISPR guides, and more for simultaneous measurement of gene expression and additional cellular features in the same single cell.

Cell surface protein

Single Cell Gene Expression

Chromium Single Cell Gene Expression provides single cell transcriptome 3' gene expression and multiomic capabilities to explore cellular heterogeneity, discover novel targets, and identify biomarkers with combined detection of surface protein expression in each cell.

Assay input: Fresh cells or nuclei

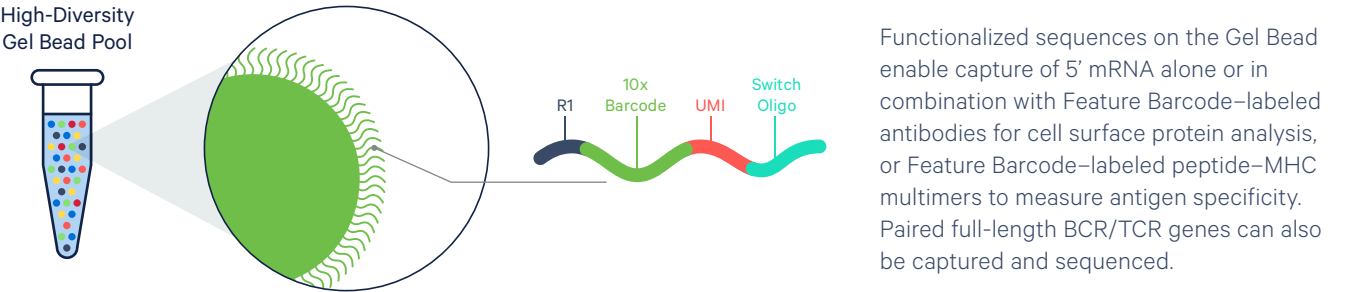


Functionalized sequences on the Gel Bead enable capture of 3' mRNA alone or in combination with Feature Barcode-labeled antibodies for cell surface protein analysis. Feature Barcode sequences are complementary to the Capture Sequences on Gel Beads.

Single Cell Immune Profiling

Chromium Single Cell Immune Profiling provides a multiomic solution to tackle your immunology questions. Analyze 5' gene expression, surface protein expression, CRISPR edits, and paired full-length B-cell or T-cell receptors (BCR/TCR), all from a single cell. Add on BEAM (Barcode Enabled Antigen Mapping) to enable screening of BCRs/TCRs against putative antigens in conjunction with gene expression, V(D)J sequencing, and cell surface marker expression.

Assay input: Fresh whole cells or nuclei



Barcode Enabled Antigen Mapping (BEAM)

BEAM is seamlessly integrated into the Single Cell Immune Profiling workflow to enable readouts of antigen specificity and paired full-length V(D)J sequences for B- or T-cell receptors, alongside 5' gene expression. Samples are labeled with uniquely barcoded BEAM Conjugates bearing antigens/peptides of interest. Each BEAM Conjugate is composed of a streptavidin, a fluorophore molecule (phycoerythrin, PE), and a Feature Barcode oligonucleotide.

BEAM-Ab and BEAM-T assemblies

Cell surface protein

Feature Barcode technology also allows for the identification of cell surface proteins while indexing each cell's transcriptome. Cells are labeled with antibodies conjugated to a Feature Barcode oligonucleotide, which is directly captured during cell partitioning, prior to library generation and sequencing.

CRISPR screening

Obtain perturbation phenotypes along with gene expression profiles via direct capture of mRNA and single-guide RNAs from the same cell. Cells are transduced with sgRNA and Cas9 prior to GEM generation. sgRNAs are engineered with a Feature Barcode on the 5' end to facilitate cDNA amplification and generation of CRISPR screening libraries.

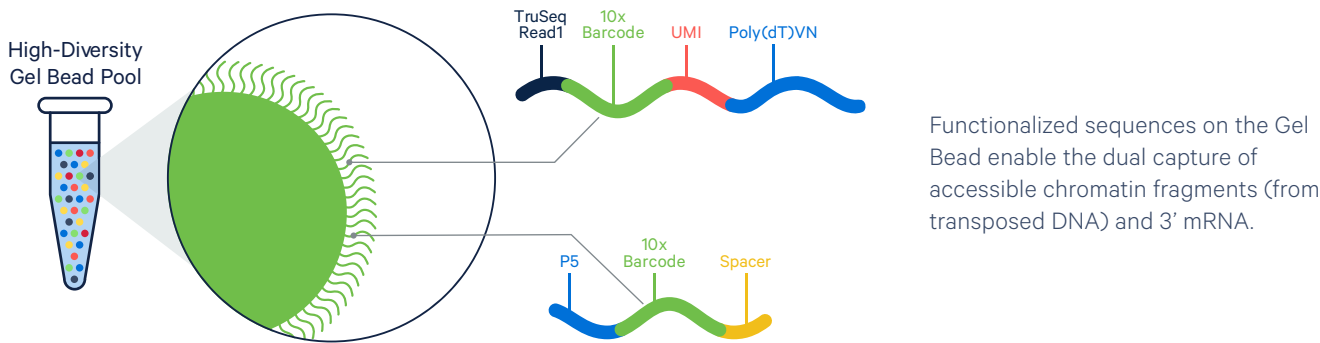
Cell surface protein

CRISPR perturbations

Single Cell Multiome ATAC + Gene Expression

Simultaneously profile gene expression and open chromatin from the same cell with Chromium Single Cell Multiome ATAC + Gene Expression. Multiply your power of discovery to characterize cell types and states, and uncover gene regulatory programs.

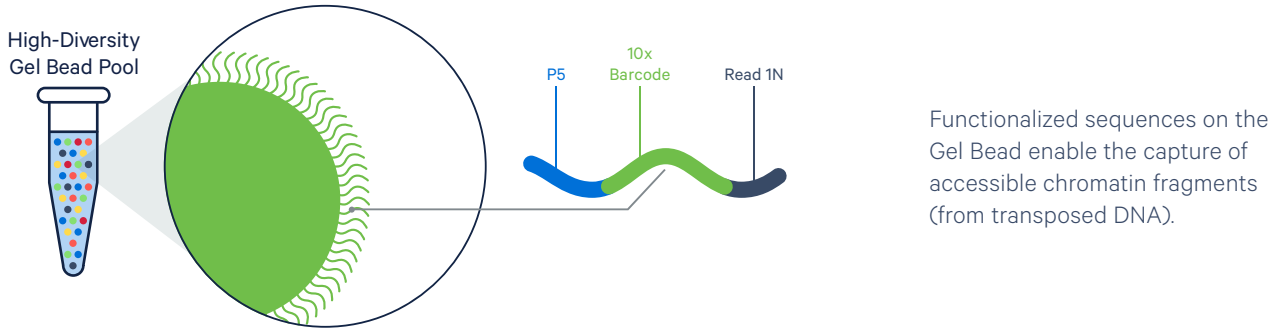
Assay input: Nuclei



Single Cell ATAC

Chromium Single Cell ATAC (Assay for Transposase Accessible Chromatin) allows you to analyze chromatin accessibility at the single cell level, providing insights into cell types and states and a deeper understanding of gene regulatory mechanisms.

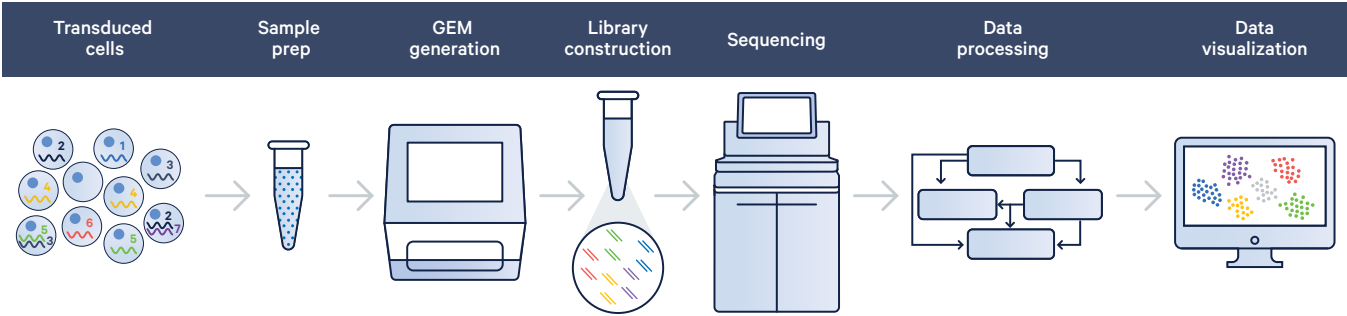
Assay input: Nuclei



Single Cell CRISPR Screening

Single cell CRISPR screens enable scalable, comprehensive readouts of cellular phenotypes directly assessing both the specific CRISPR-driven gene edits or knockdowns and the resulting perturbed phenotypes, including gene expression and cell surface proteins.

Compatible assays: Single Cell Immune Profiling (5' gene expression assay), Single Cell Gene Expression (3' gene expression assay)

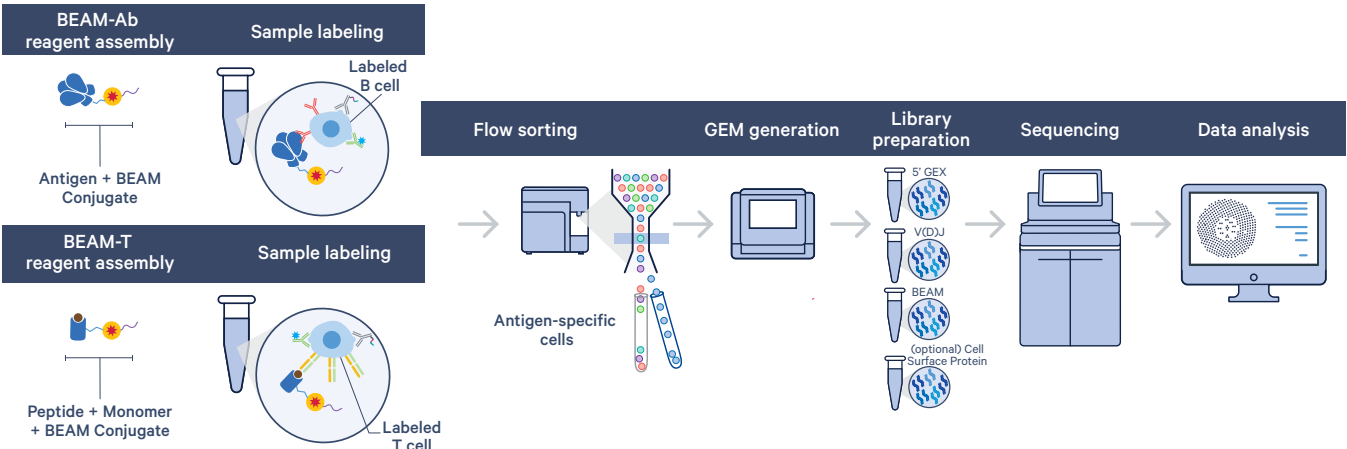


Cells expressing CRISPR-Cas9 are transduced with a pool of guide RNAs (gRNAs) before processing with the Single Cell 5' or 3' Gene Expression assay. After GEM generation with the Chromium instrument, separate libraries for CRISPR guide sequences, gene expression, and optional cell surface protein and immune receptor sequences can be constructed from a single sample, generating multiple readouts that can be linked back to the same single cell.

Barcode Enabled Antigen Mapping (BEAM)

Rapidly discover antigen-specific B-cell (BEAM-Ab) and T-cell (BEAM-T) clonotypes with unparalleled cellular characterization. Built on the proven Single Cell Immune Profiling workflow, BEAM enables screening of BCRs/TCRs against putative epitopes in conjunction with gene expression, V(D)J sequencing, and cell surface marker expression.

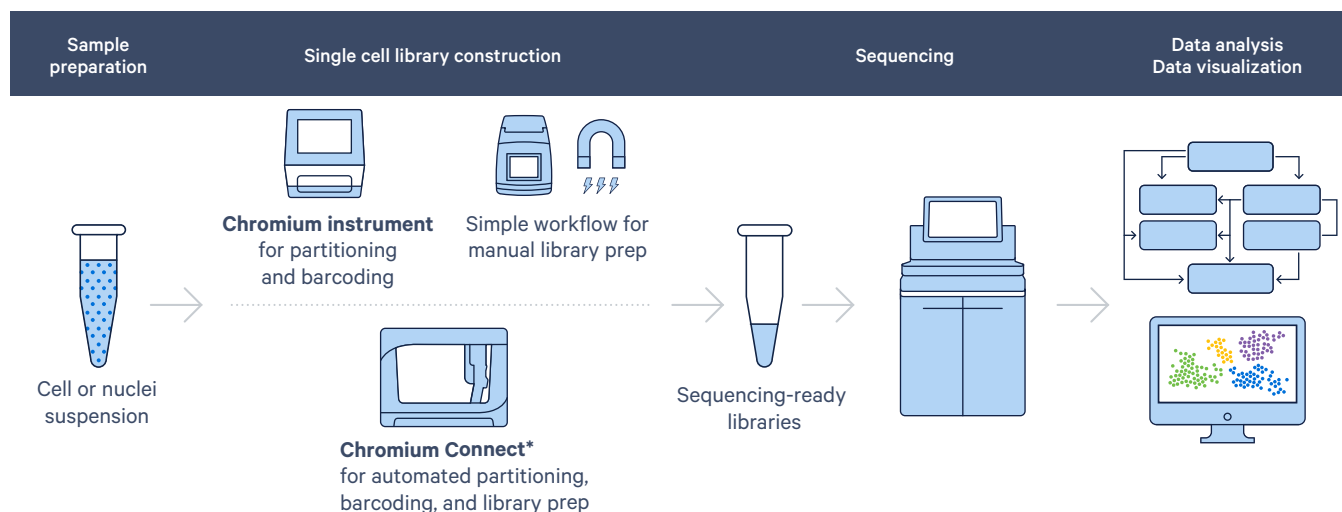
Compatible assays: Single Cell Immune Profiling



Starting with a single cell suspension of unlabeled cells, user-supplied antigens are barcoded using 10x Genomics BEAM reagents. Barcoded antigens are then used to stain B or T cells prior to flow sorting for enrichment. Normal library preparation steps and sequencing is then carried out on the sample. (Note: BEAM-Ab and BEAM-T are performed in separate workflows with unique reagents.)

Chromium Single Cell workflow


The Chromium platform is a transformative technology that fits easily into your existing lab infrastructure. This end-to-end single cell sequencing solution includes sample preparation support and turnkey data analysis and visualization tools.



*Compatible with Chromium Single Cell Gene Expression and Immune Profiling.

Chromium instrument family

Chromium instruments use advanced microfluidics to perform single cell partitioning and barcoding in a matter of minutes, enabling a seamless workflow from single cell or nuclei suspensions to sequencer-ready libraries.

	Chromium X Series	Chromium Connect
		
Instrument dimensions	11.25" x 19" x 10.75"	42" x 28" x 35"
Instrument weight	41.4 lb (18.8 kg)	350 lb (158.8 kg)
Supported workflow	Manual	Automated
Supported single cell assays	All assays and throughputs (low, standard, and high)	Gene Expression Immune Profiling

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