

Profiling Chromatin Accessibility at Single Cell Resolution

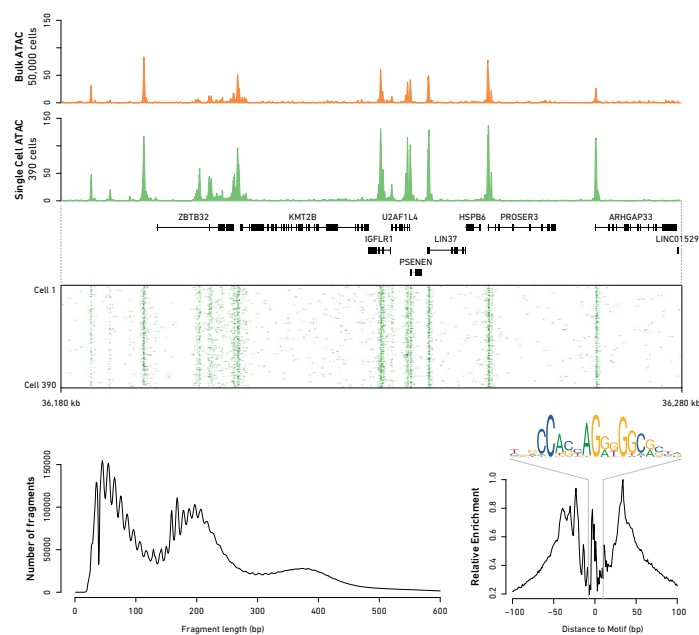
The Chromium Single Cell ATAC Solution (with Chromium Next Gem Technology)

Chromatin organization compacts meters of DNA into the nucleus, making just a small fraction of DNA accessible for transcription within each cell. The Chromium Single Cell ATAC (Assay for Transposase Accessible Chromatin) Solution provides a robust and scalable approach to map the epigenetic landscape at single cell resolution. Using a transposase enzyme to preferentially tag accessible DNA regions with sequencing adaptors, researchers can now generate sequencing-ready libraries and identify open chromatin regions. Our simple, high-throughput workflow, combined with intuitive software, enables understanding of epigenetic and regulatory variation across tens of thousands of cells.

Highlights

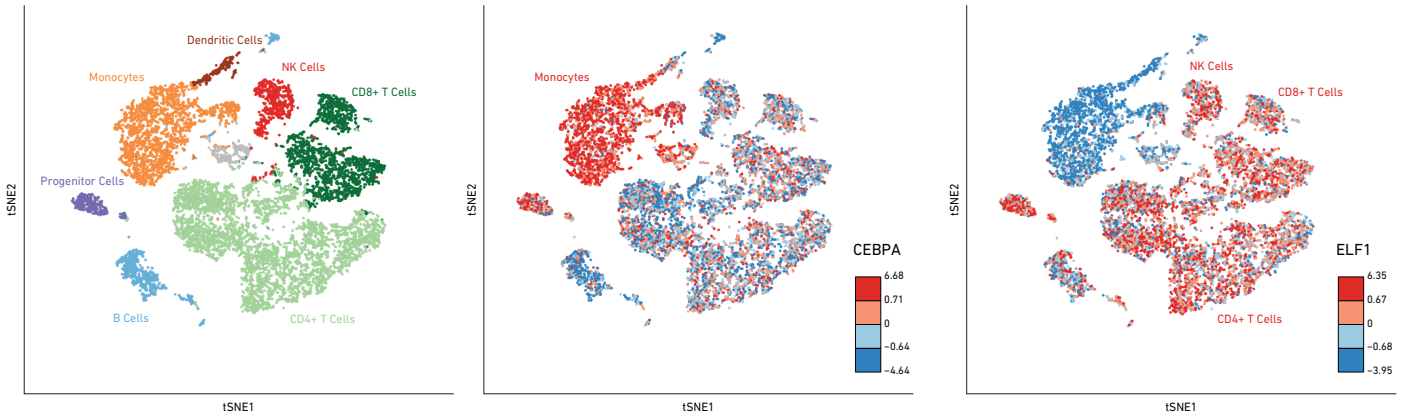
- Detect open chromatin with enriched signals in Transcription Start Sites (TSS) and regulatory regions
- Investigate and compare open chromatin in regions of interest
- Cluster and identify cells based on open chromatin regions and enriched transcription factor (TF) motifs
- Execute simple, streamlined workflow in less than one day
- Profile 500 to 10,000 nuclei per channel for a high-throughput, cost-effective solution
- Recover up to 65% of nuclei loaded on chips
- Demonstrated with cell lines, primary cells, fresh, and cryopreserved samples
- Turnkey bioinformatics analysis software and interactive visualization tools
- Based on Next GEM technology

Characteristic Open Chromatin Profiles at Single Cell Resolution



Top: Representative tracks of open chromatin regions from GM12878 cell line. The upper track (orange) represents data gathered from 50,000 nuclei using bulk ATAC-seq, while the lower track (green) is aggregated from 390 individual nuclei run on the Chromium Single Cell ATAC Solution. Even with data from 100-fold fewer nuclei, the Chromium Single Cell ATAC Solution demonstrates a similar sensitivity to that of bulk ATAC-seq. Middle: Transposition events detected in single cells using the Chromium Single Cell ATAC Solution from the same sample and genomic locus of GM12878 cell line. Bottom left: Insert size distribution of Single Cell ATAC fragments from GM12878 cells reveals protection of DNA by individual nucleosomes and nucleosome multimers, along with a nucleosome periodicity of 184 base pairs. Bottom right: Cumulative footprinting signal at predicted transcription factor (CTCF)-binding sites in GM12878 cell line generated by aggregating Chromium Single Cell ATAC data. The dotted lines indicate the location of the known CTCF motif (pictogram above the plot; JASPAR CTCF motif MA0139.1).

Single Nuclei Epigenetic Profiling of Peripheral Blood Mononuclear Cells (PBMCs)



Left: tSNE projection of ~10,000 PBMCs from a healthy donor. Each cell is plotted in tSNE coordinates, colored by their annotated cell types. Major subpopulations were identified based on enrichment scores of well characterized TF motifs and cell-type specific peaks. Clustering patterns suggest that there is extensive substructure within each major classification. Middle, Right: Single nuclei epigenetic profiles overlaid on tSNE projections for CEBPA (marker of Monocytes) and ELF1 (marker of T cells and Natural Killer (NK) Cells.). The PBMC population comprises 20% of Monocytes and 66% of T and NK cells consistent with FACS analysis of the cells.

Applications

- Cellular Heterogeneity
 - From Epigenetic Variability
- Gene Regulatory Networks
 - Upstream of Gene Expression
- Cell Lineage and Developmental Program Tracing
- Biomarker Discovery

Research Areas

- Stem Cell / Developmental Biology
- Oncology
- Immunology
- Neuroscience

Additional Resources

- Datasets go.10xgenomics.com/scATAC/datasets
- Seminars go.10xgenomics.com/scATAC/seminars
- Application Notes go.10xgenomics.com/scATAC/app-notes
- Technical Support go.10xgenomics.com/scATAC/support
- Publications go.10xgenomics.com/scATAC/pubs

Products	Product Code
Chromium Next GEM Single Cell ATAC Library & Gel Bead Kit v1.1, 16 rxns ¹	1000175
Chromium Next GEM Single Cell ATAC Library & Gel Bead Kit v1.1, 4 rxns ¹	1000176
Chromium Next GEM Chip H Single Cell Kit, 48 rxn ¹	1000161
Chromium Next GEM Chip H Single Cell Kit, 16 rxn ¹	1000162
Chromium i7 Multiplex Kit N, Set A, 96 rxn	1000084
Chromium Controller & Next GEM Accessory Kit, 12 Mo. Warranty ¹	1000202
Chromium Controller & Next GEM Accessory Kit, 24 Mo. Warranty ¹	1000204
Cell Ranger ATAC Pipeline go.10xgenomics.com/scATAC/cell-ranger-ATAC	Download
Loupe Cell Browser go.10xgenomics.com/scATAC/loupe-cell	Download

¹ Next GEM reagents are specific to Next GEM products and should not be used interchangeably with non-Next GEM reagents.