Gene Expression and CRISPR-Mediated Perturbations at Scale

Feature Barcode Technology for CRISPR Screens

Pooled CRISPR screening is a powerful method for identifying genes involved in complex biological mechanisms such as cell proliferation, cell survival and drug/toxin resistance. Cells are transduced with a pooled lentiviral library containing guide RNAs (gRNAs) targeting tens, to hundreds, to thousands of genes in a given genome. These libraries can be designed for common CRISPR applications including genetic knockout, activation, cutting, and repression.

The Chromium Single Cell Gene Expression Solution (with Next GEM technology) combined with Feature Barcode technology provides a high-throughput and scalable approach to assess the effects of perturbations on gene expression via direct capture of gRNAs and polyadenylated mRNAs from the same single cell. This powerful solution lets you analyze regulatory gene networks and pathways involved in development and disease, resolve complex biological pathways and dissect cellular regulation at a massive scale with single cell resolution.

Highlights

• Simultaneously assess perturbation phenotypes and gene expression from the same cell
• Enable high-throughput and high-resolution functional genetic screens in hundreds to tens of thousands of cells simultaneously
• Determine comprehensive gene expression phenotypes for individual perturbations
• Customize your CRISPR pools with dozens, to hundreds, to thousands of gRNAs
• Implement an improved and novel methodology over published methods by directly capturing and sequencing gRNAs, eliminating the need for a proxy barcode
• Based on Next GEM technology

High-throughput Perturbation Studies Enabled via Feature Barcode Technology

A. K562 cells expressing CRISPR/Cas9 were transduced with a pool of 18 gRNAs (8 targeting: 4 genes, 2 targets per gene and 10 non-targeting guides) before 10260 cells were profiled with the Chromium Single Cell Gene Expression Solution. B. 60% of the cells profiled were found to contain a single gRNA, 30% of cells were found to contain 2 – 6 gRNAs, and the remaining 10% of cells did not contain a gRNA.
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Feature Barcode Technology Enables Determination of Knockdown Efficiency

Violin plots illustrating the differences in UMI counts and knockdown efficiency per Target Gene relative to the control (cells containing the non-targeting guides). The white dots represent the median. **A.** Target Gene 1, **B.** Target Gene 2, **C.** Target Gene 3, and **D.** Target Gene 4.

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**Solution Features**

- Ready-to-use, robust protocols including applications using Feature Barcode technology
- Compatible partners for gRNA components and support
- Documentation for custom gRNA design for use with the Feature Barcode technology
- Easy-to-use and convenient software with Cell Ranger Analysis Pipelines and Loupe Cell Browser visualization tool

**System Features**

- Partition 100 – 80,000+ cells efficiently
- Scalable; run up to 8 samples in parallel
- Superior sensitivity
- Simple workflow
- Cell size flexibility, no lower limits
- High cell capture rates of up to 65%
- Low doublet rates of under 0.9% in 1000 cells

10xgenomics.com/single-cell
Applications

- Functional Genetic Screens
- Drug Screens
- Biomarker Discovery
- Target Validation from Large-scale Screens
- Resolution of Complex Gene Regulatory Networks
- Gene Signature Identification
- Cell State & Lineage Tracing
- Clonal Expansions During Disease Development

Research Areas

- Basic & Translational Research
- Cancer Research
- Infectious Disease
- Immuno-oncology
- Metabolic Disorders
- Developmental Biology

Additional Resources

Datasets  go.10xgenomics.com/scRNA-3/datasets
Seminars  go.10xgenomics.com/scRNA-3/seminars
Application Notes  go.10xgenomics.com/scRNA-3/app-notes
Technical Support  go.10xgenomics.com/scRNA-3/support
Publications  go.10xgenomics.com/scRNA-3/pubs

Products

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<thead>
<tr>
<th>Products</th>
<th>Product Code</th>
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<tr>
<td>Cell Ranger</td>
<td>go.10xgenomics.com/scRNA-3/cell-ranger Download</td>
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<tr>
<td>Loupe Cell Browser</td>
<td>go.10xgenomics.com/scRNA-3/loupe-cell Download</td>
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1 Next GEM reagents are specific to Next GEM products and should not be used interchangeably with non-Next GEM reagents.
Resources from 10x Genomics

We are dedicated to helping you get the most out of your 10x Genomics system by offering multiple helpful resources:

**Solutions and products**
Along with our suite of complete solutions, we offer an ever-growing catalogue of services to help you find the answers to your research questions.

**10x Compatible Products**
Access our list of key partner products that have been certified compatible to work with our various solutions.

**10x University**
Immerse yourself in 10x University, a comprehensive step-by-step learning and training environment containing video tutorials and trainings.

**Blog**
Keep up to date with the 10x Genomics Blog, where you’ll find everything from tips and tricks to the latest 10x news.

**10x Library**
Easy access to our complete library of product literature, customer publications, application notes, protocols, and many other useful resources.

**Support**
Visit the support site for documentation, software, and datasets that will help you get the most out of your 10x Genomics products.

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