# Lipid-Modified Oligonucleotides For Sample Barcoding in Droplet Microfluidics-Based Single-Cell RNA Sequencing

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## INVENTION NOVELTY

A new strategy for barcoding single living cells using lipid-modified oligonucleotides that can vastly enhance sample multiplexing in droplet microfluidics-based RNA sequencing

## VALUE PROPOSITION

Single-cell RNA sequencing has recently emerged as a powerful tool for mapping transcriptional changes in heterogeneous cell populations. Recently, large-scale genomic screens combined with single-cell RNA sequencing have been utilized to understand complex biological phenomena. Novel insights could also be gained from coupling single-cell RNA sequencing to chemical library or drug screens, but methods for stably labeling living cells with oligonucleotide barcodes are lacking. Lipid-modified oligonucleotides represent an inexpensive, scalable, and technically simple method for labeling cell membranes in a fashion that interfaces with existing single-cell RNA sequencing workflows using droplet microfluidics.

This new cell barcoding method provides the following advantages:

- Significantly **increase the current sample and cell multiplexing capacity** of scRNA sequencing workflows.
- Dramatically **decrease labor and material costs and increase efficiency** of creating a sequencing library by performing the multiplexing early in the workflow
- **Avoid or remove technical artifacts** due to fixation, doublets, or activation of cell surface receptor-mediated transcriptional responses
- Uses a **universal cell-labeling platform** that can be applied in any biological context, without requiring *a priori* knowledge of cell surface markers
- Barcodes are **inexpensive to synthesize and stable at room temperature**.

## TECHNOLOGY DESCRIPTION

Researchers at University of California, San Francisco have developed a new cell barcoding method that uses lipid-conjugated oligonucleotides to efficiently label single live cells derived from distinct patients or test conditions. Oligonucleotide barcodes (engineered with a PCR handle, unique identifier and PolyA sequence) can be subsequently introduced to the cells and subsets of the cells processed for droplet microfluidics-based RNA sequencing library preparation. This method can be commercially applied

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OTHER INFORMATION

KEYWORDS

Single Cell RNA Sequencing, Barcoding, Droplet microfluidics, Library preparation, Clinical & preclinical samples

CATEGORIZED AS

- **Biotechnology**
  - Bioinformatics
  - Genomics
- **Medical**
  - Screening
- **Research Tools**

in the form of 96-, 384-, 1536- or 3456-well plates containing lipid-modified oligonucleotides prehybridized to sample barcodes. Cells derived from distinct perturbations or clinical samples could be barcoded via dispensing into unique wells upstream of labeling and single-cell RNA sequencing.

## LOOKING FOR PARTNERS

To develop and commercialize this technology, potentially as a cell barcoding kit for droplet microfluidics-based RNA sequencing.

## APPLICATION

Single cell RNA sequencing library preparation

## STAGE OF DEVELOPMENT

Proof of Concept

## DATA AVAILABILITY

Under NDA/CDA

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| Japan | Issued Patent | 7456637 | 03/18/2024 | 2018-119 |
| European Patent Office | Published Application | 3818151 | 05/12/2021 | 2018-119 |
| China | Published Application | CN112654699A | 04/13/2021 | 2018-119 |

Additional Patents Pending

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- XYZeq – Spatially-Resolved Single Cell Sequencing

- Nucleic Acids/DNA/RNA
- Screening Assays

**RELATED CASES**

2018-119-0

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