

4D-seq: Single Cell RNA-sequencing with in situ Spatiotemporal Information

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Single Cell RNA Sequencing,
4-dimensional Sequencing,
Transcriptomics,
Spatial/Temporal Information,
Barcoding, Cancer, Live
Tissue Imaging

CATEGORIZED AS

- ▶ **Biotechnology**
 - ▶ Bioinformatics
 - ▶ Genomics
- ▶ **Medical**
 - ▶ Disease: Cancer
- ▶ **Research Tools**
 - ▶ Bioinformatics
 - ▶ Nucleic Acids/DNA/RNA

RELATED CASES

INVENTION NOVELTY

To develop a novel imaging-based single cell RNA-sequencing (scRNA-Seq) platform that allows capturing of spatiotemporal information and cellular behavior of the sequenced cells within tissue.

VALUE PROPOSITION

scRNA-Seq generates transcriptomic profile for individual cells, allowing elucidation of sophisticated heterogeneous gene expression and splicing patterns in a seemingly homogeneous cell population. Current isolation of single cells for scRNA-Seq involves complete tissue disruption, thus inevitably destroying key information regarding position and behavior of cells in the tissue.

The present invention "4D-Seq" harnesses two-photon microscopy and DNA-labelling techniques to enable capturing of cellular spatial and time-varying information within the tissue prior to scRNA-seq analysis. This spatial information can then be correlated in turn with 2P microscopy data of the same tissue, effectively linking scRNA-Seq with visualized environmental parameters as well as time-dependent behaviors such as migration, and cell-cell interactions in tumor microenvironments.

TECHNOLOGY DESCRIPTION

Investigators at University of California, San Francisco, have invented new technology to capture spatial information in scRNA-seq experiments. The invention involves labelling of cells within tissues by attachment of oligonucleotide barcodes to the surface of cells in a light-dependent manner. Two-photon microscopy will be used to image the tissue, as well as photo-activate oligonucleotide barcodes to label cells in specific regions at any desired time. The spatial information derived from imaging can then be correlated with scRNA-seq data using barcode sequences, thereby providing researchers with spatial information about gene expression patterns within tissues.

LOOKING FOR PARTNERS

To develop & commercialize the technology as a spatiotemporal imaging platform for correlating gene expression with in situ cellular behaviors.

STAGE OF DEVELOPMENT

Pre-Clinical

DATA AVAILABILITY

Proof of Concept Data Pending

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,559,787	02/24/2026	2018-020
European Patent Office	Issued Patent	3797171	08/27/2025	2018-020
United Kingdom	Issued Patent	3797171	08/27/2025	2018-020

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