Development of custom single-cell assay protocols using the ICELL8 cx system and open architecture

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Abstract

The use of next-generation sequencing in clinical research and applied spaces requires accurate, parallel processing of large numbers of samples and the availability of chemistries that enable robust library preparation from the desired targets. Given the rapid advancements in single-cell and nucleic acid research, one of the challenges is finding an instrument platform that can support such dynamic fields. In this poster, we will present a diversity of single-cell assays workflows developed successfully using the ICELL8 cx Single-Cell System’s nanowell technology, imaging capabilities, and software solutions.

Developing new assays for high-throughput analysis of single cells requires an open and flexible platform. The ICELL8 cx system was designed with these features in mind, and the new ICELL8 cx CELSTUDIO™ v2.0 Software (CELSTUDIO Software) provides a simple graphical user interface (GUI) for developers to design, test, and improve their own miniaturized protocols. The types and number of samples that can be tested are configurable, and utilizing multiple reaction source wells allows for multiple reaction conditions to be tested in parallel. Along with high numbers of replicates for each reaction condition, positive and negative controls can be included with each test condition, giving researchers confidence in their results. The ICELL8 cx system is also a high-throughput method to isolate nuclei or single cells of any size—even accommodatingcardiomyocytes and organsoids—while providing control over the selection of the isolated cells out of all available 5,164 nanowells. Furthermore, the system enables the flexibility to analyze multiple parameters per experiment and uses the power of ICELL8 cx to distinguish and select desired cells based on viability or phenotype—allowing meaningful conclusions to be drawn from the data. CELSTUDIO Software and the ICELL8 cx system together provide an ideal system for the development of miniaturized, high-throughput single-cell assays.

Executive summary

Obtaining meaningful results from NGS assays requires researchers to have an unbiased method to analyze large numbers of cells, greater control over the selection of the cells to be processed, and the ability to proceed only with the wells you choose, such as eliminating the noise from multiple-cell-containing or empty wells.

1 An end-to-end solution for your single-cell needs

An end-to-end solution for your single-cell needs. At Takara Bio, we understand the challenges that come with automating and scaling your single-cell workflow. To help accelerate your research, we have designed the ICELL8 cx system to be an open, flexible platform compatible with trusted reagents and easy-to-use software tools that simplify your experimental workflow.

2 Limitless possibilities for creating your NGS assays

Limitless possibilities for creating your NGS assays. The ICELL8 cx system offers the CELSTUDIO Software application tool, which allows you to miniaturize and automate your single-cell or NGS assay at low sample levels in a high-throughput manner. The CELSTUDIO Software provides flexibility in reaction design and protocols, enabling researchers to develop their own applications.

3 Flexibility to explore the questions that matter

Flexibility to explore the questions that matter. The ICELL8 cx system features built-in, proprietary CellSelect Software analyzes well images and provides the ability to proceed only with the wells you choose, such as eliminating the noise from multiple-cell-containing or empty wells.

4 Power to handle samples of any size

Power to handle samples of any size. The ICELL8® cx Single-Cell System’s nanowell technology, imaging capabilities, and software solutions meet these requirements with an integrated and automated platform that lets you conduct your single-cell sequencing projects your way.

5 Confidence in your data with cell visualization

Confidence in your data with cell visualization. The ICELL8 cx system features built-in proprietary CellSelect Software analyzes well images and provides the ability to proceed only with the wells you choose, such as eliminating the noise from multiple-cell-containing or empty wells.

6 Greater control over your downstream processing

Greater control over your downstream processing. The ICELL8 cx system features built-in proprietary CellSelect Software analyzes well images and provides the ability to proceed only with the wells you choose, such as eliminating the noise from multiple-cell-containing or empty wells.

7 Innovate new applications using our open format

Innovate new applications using our open format. The ICELL8 cx system features built-in proprietary CellSelect Software analyzes well images and provides the ability to proceed only with the wells you choose, such as eliminating the noise from multiple-cell-containing or empty wells.

Customer-developed applications

Customer-developed applications. Several researchers have already designed custom single-cell epigenomic assays, nuclear sequencing strategies, and beyond.

- Shvartman, M. et al. Single-cell atlas of major hematopoietic tissues sheds light on blood cell development from embryonic stem cells. bioRxiv 2019.03.06.976451.