Bioassays from Tissue Sections and Cells Using Functionalized Hydrogels in Isolated Microwell Arrays

Technology #19917

Applications

This technology is an analyte detection assay with applications as a research tool or a diagnostic/prognostic tool. Its currently enabled to detect small nucleic acids, such as miRNAs.

Problem Addressed

Detection and quantification of analytes, such as nucleic acids, provide diagnostic information in disease. One class of nucleic acid analyte is miRNAs, small RNA molecules that regulate gene expression in cells. The miRNA repertoire of cells is highly specific to cell-type, and miRNA expression is frequently dysregulated in diseases including cancer, sepsis, organ failure, autoimmune diseases, and neurodegenerative diseases. miRNAs are therefore an attractive diagnostic and prognostic target, however, current miRNA quantitation techniques are expensive, labor intensive, and often lack multiplexed readings or high throughput capacity. These challenges in miRNA detection and quantification have thus far hindered the adoption of miRNA markers as a diagnostic or prognostic tool in the clinic. These inventors developed a novel assay that can be multiplexed and that greatly simplifies miRNA detection. In another embodiment, the technology can be used to detect analytes from stained and preserved clinical tissue sections.

Technology

This technology uses microwell reactions to detect up to 6 miRNAs from as few as 10 cells. To quantify miRNA expression, this method first seeds raw cells from liquid suspension or a tissue slices into plates with 100-1,000 microwells that each contain up to 6 probes against miRNAs of interest. Next, the cells are lysed and miRNAs are hybridized to the probes, then, adapters are ligated onto probe-bound miRNAs. Finally, the adapter handles are used to attach a fluorescent label and the fluorescence intensity of each probe is quantified via microscopy to determine the concentration of each miRNA. This assay is faster and less labor intensive than existing miRNA analysis techniques, which require intensive sample preparation and/or PCR amplification of miRNAs prior to detection. Importantly, this technology can also be applied to previously archived tissue samples to provide a quantitative readout of miRNA expression that maintains spatial information to correlate miRNA expression with histopathological features.

Advantages

- No sample prep or signal amplification steps required, which eliminates time-consuming and labor-intensive reaction steps
- Multiplexed readout of up to 6 miRNAs
- Quantitative readout of miRNA concentration with attomolar sensitivity
- Maintains spatial information to facilitate correlation of miRNA levels with histopathological features

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- Works on archived tissue samples (ex. paraffin or frozen sections)

Intellectual Property

IP Type: Published US Patent

IP Title: Apparatuses and methods for cell and tissue assays and agent delivery

IP Number: US 2019-0154679

Categories For This Invention:

Life Sciences
Clinical Applications
Oncology
Diagnostics
Prognostics
Markers
Research Tools
RNA

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Publications:

Quantitative and multiplex microRNA assays from unprocessed cells in isolated nanoliter well arrays
Lab Chip
2018

External Links:

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