Integrated Silicon Based Microfluidics for Personalized Point-of-Care Diagnostics

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Project Description: Obtain single-cell isolation and genomic analysis in an integrated point-of-care diagnostic system

Future Work:
- Obtain single cell analysis with confidence intervals
- Successfully perform PCR experiments with microliter volumes
- Sequencing DNA for rapid disease detection

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References:
1. Welcome to Funai Microfluidics. (n.d.). Retrieved May 12, 2018

Figure 1: Funai microfluidic chip. Cells are inserted into fluid manifold and are dispensed from the nozzles.

Benefits of Microfluidics:
- Uses very small volumes ranging from 1 microliter to 1 picoliter
- Rapid home-based analysis using heat and mass transfer of fluids through microfluidic chip
- Capable of precision down to a single cell

Microfluidic Chip:
- Understand mechanism of cell movement through a microfluidic chip
- Conduct CellTiter Glo Assay experiments to produce a standard curve
- Accomplish single-cell isolation in a well plate
- Conduct qPCR experiments to amplify DNA

Current Process: Involves 5 steps using different instruments. This a cumbersome and expensive process.

Proof of Concept: CellTiter Glo Assay Success with Low Cell Count

- A homogeneous method used to determine number of cells present in each well
- Glo reagent lyses the cells and luminescence is measured
- Luminescence directly correlates to cell count
- Microfluidic device dispenses cells efficiently and reliably at lower cell count than hand pipetting

*Fluorimeter resolution is limited at low cell count

Figure 2: Results obtained from CellTiter Glo Assay, the amount of cells corresponds to the luminescence intensity measured from microplate reader.