

Background:

- Microfluidic point-of-care diagnostic system for disease detection
- Perform experimental procedure using a microfluidic platform
- Dispense cells using a microfluidic chip into a well plate to perform single-cell genetic analysis

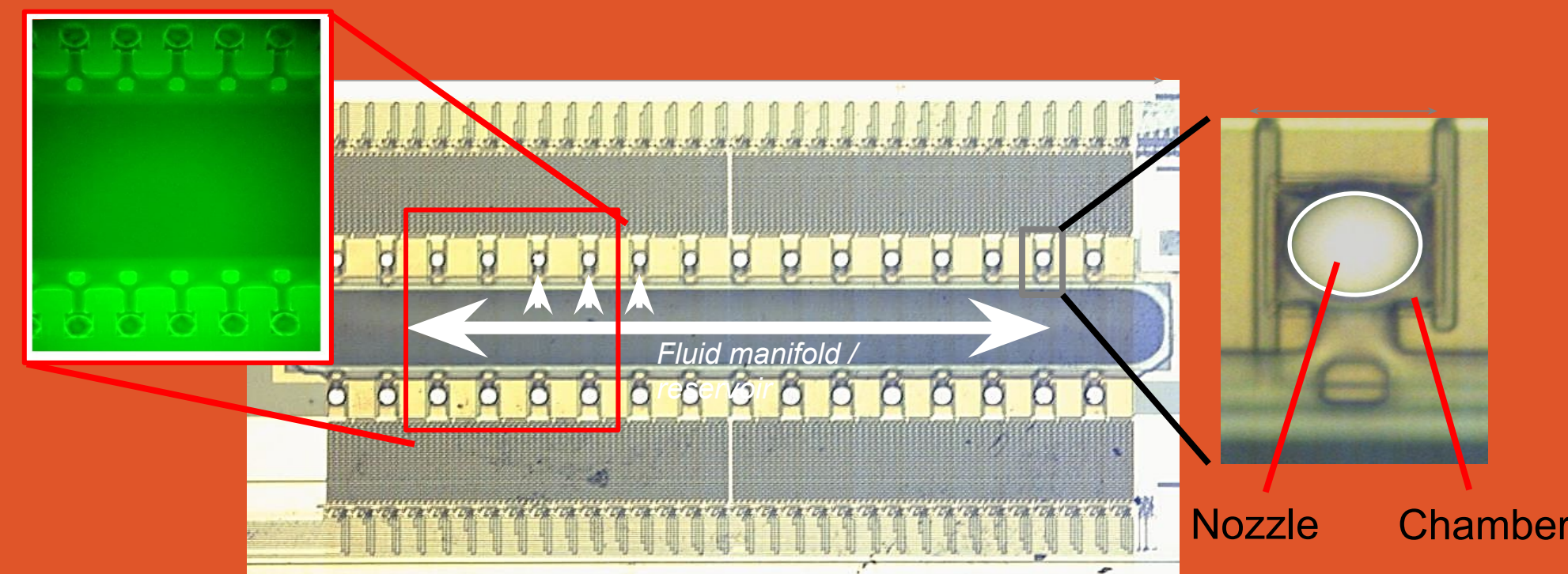
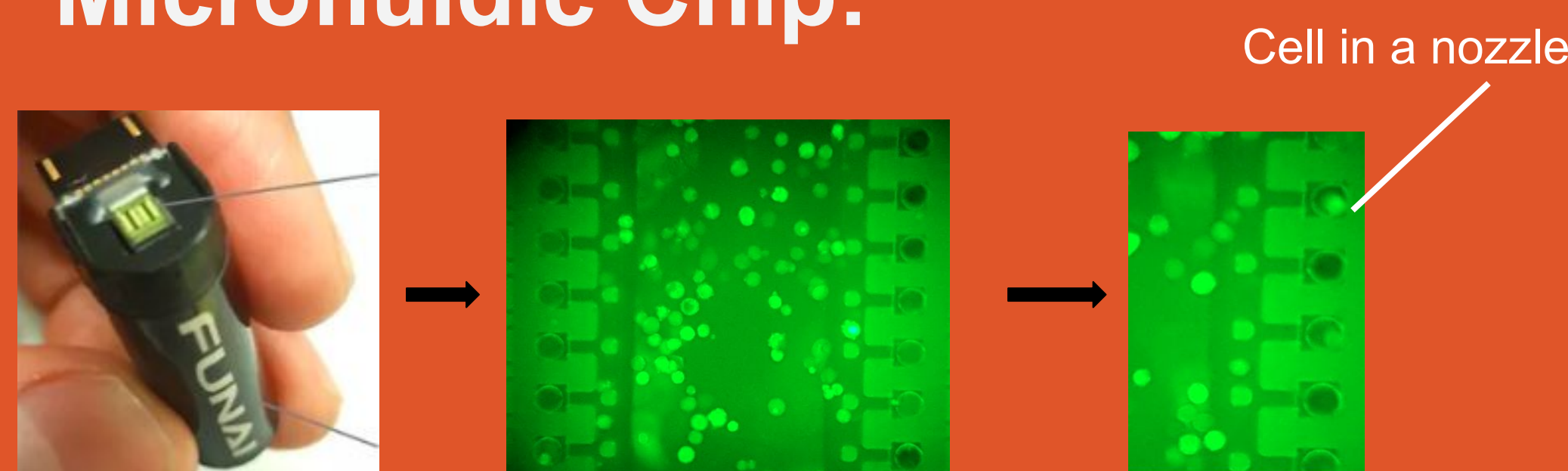


Figure 1: Funai microfluidic chip. Cells are inserted into fluid manifold and are dispensed from the nozzles.

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:



Project Goals:

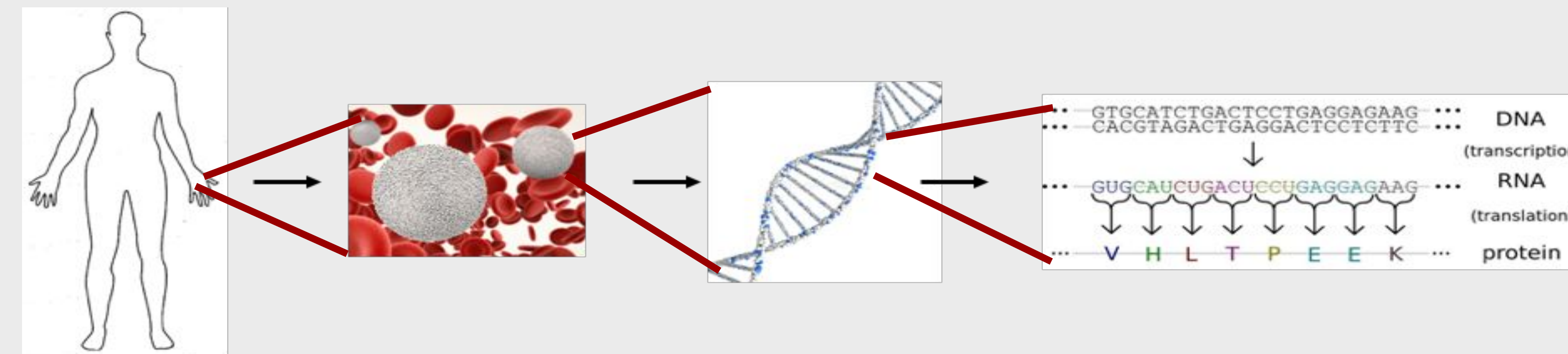
- Understand mechanism of cell movement through a microfluidic chip
- Conduct CellTiter Glo Assay experiments to produce a standard curve
- Accomplish single-cell isolation in a well plate
- Conduct qPCR experiments to amplify DNA



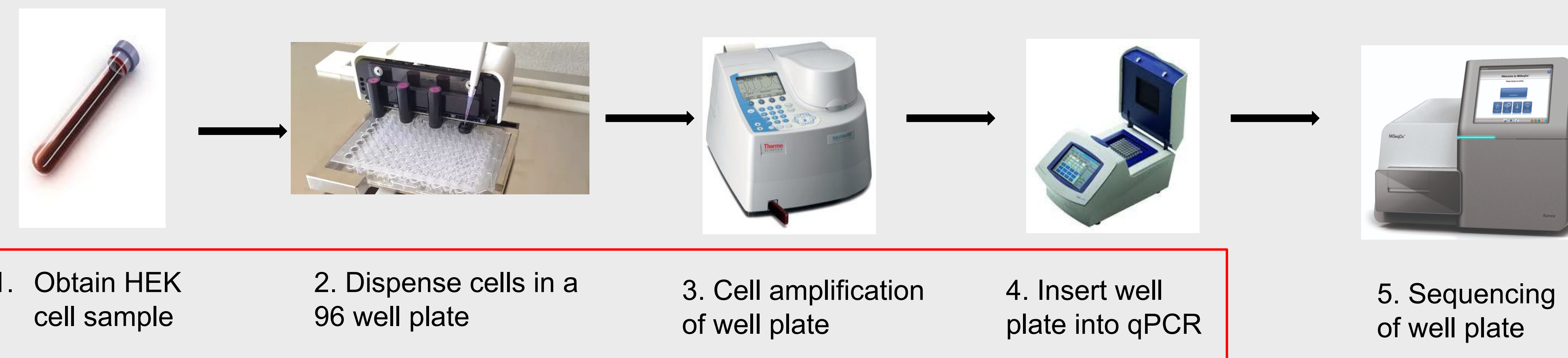
Integrated Silicon Based Microfluidics for Personalized Point-of-Care Diagnostics

Funai Corporation

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



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

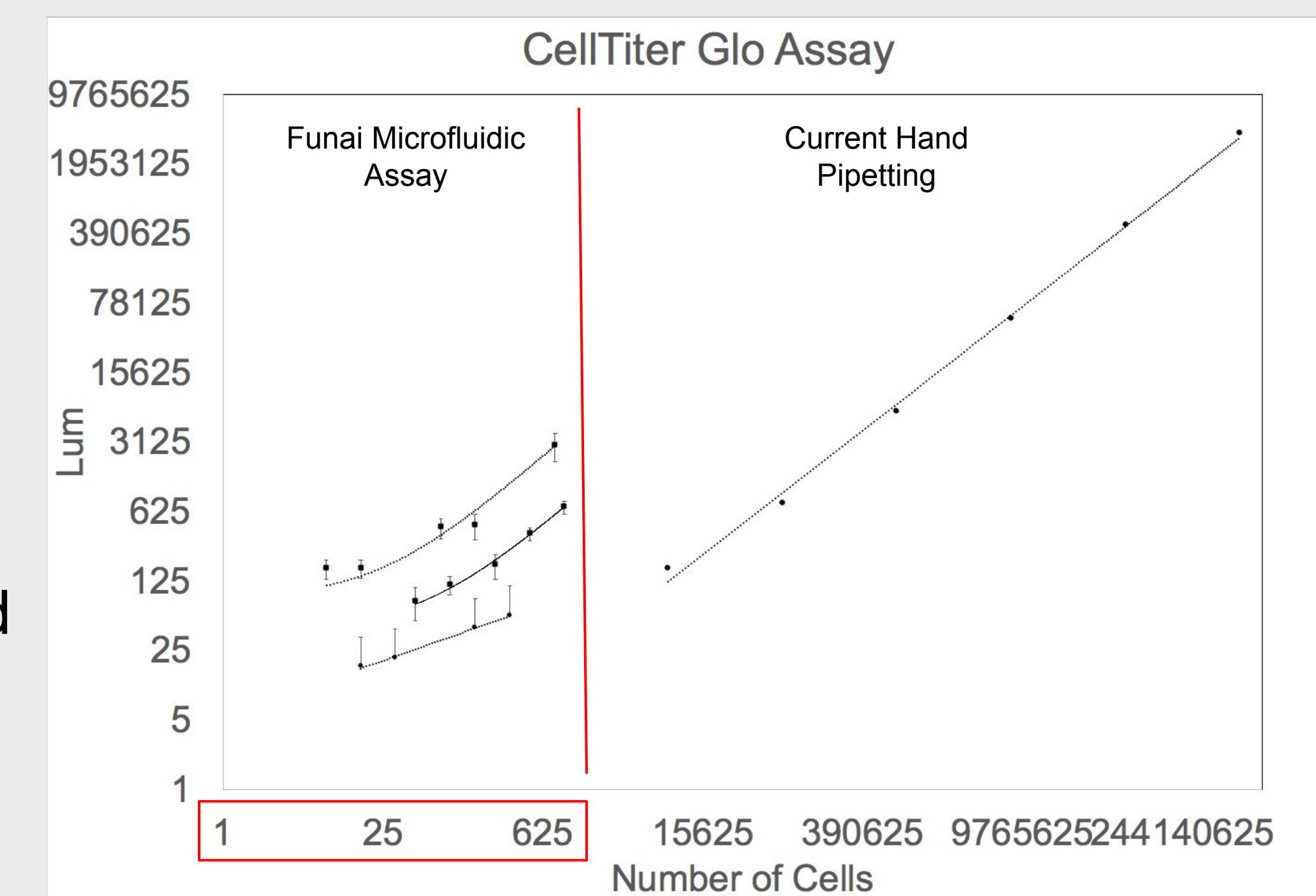


Figure 2: Results obtained from CellTiter Glo Assay, the amount of cells corresponds to the luminescence intensity measured from microplate reader.

Funai Process:

- Integrated platform combining steps of dispensing, cell amplification, qPCR analysis, and sequencing
- Microfluidic device that has imaging capability to detect cell count in each nozzle (single cell visualization)
- Integrated, low-cost, automated, miniaturized device that is readily accessible to inpatient care

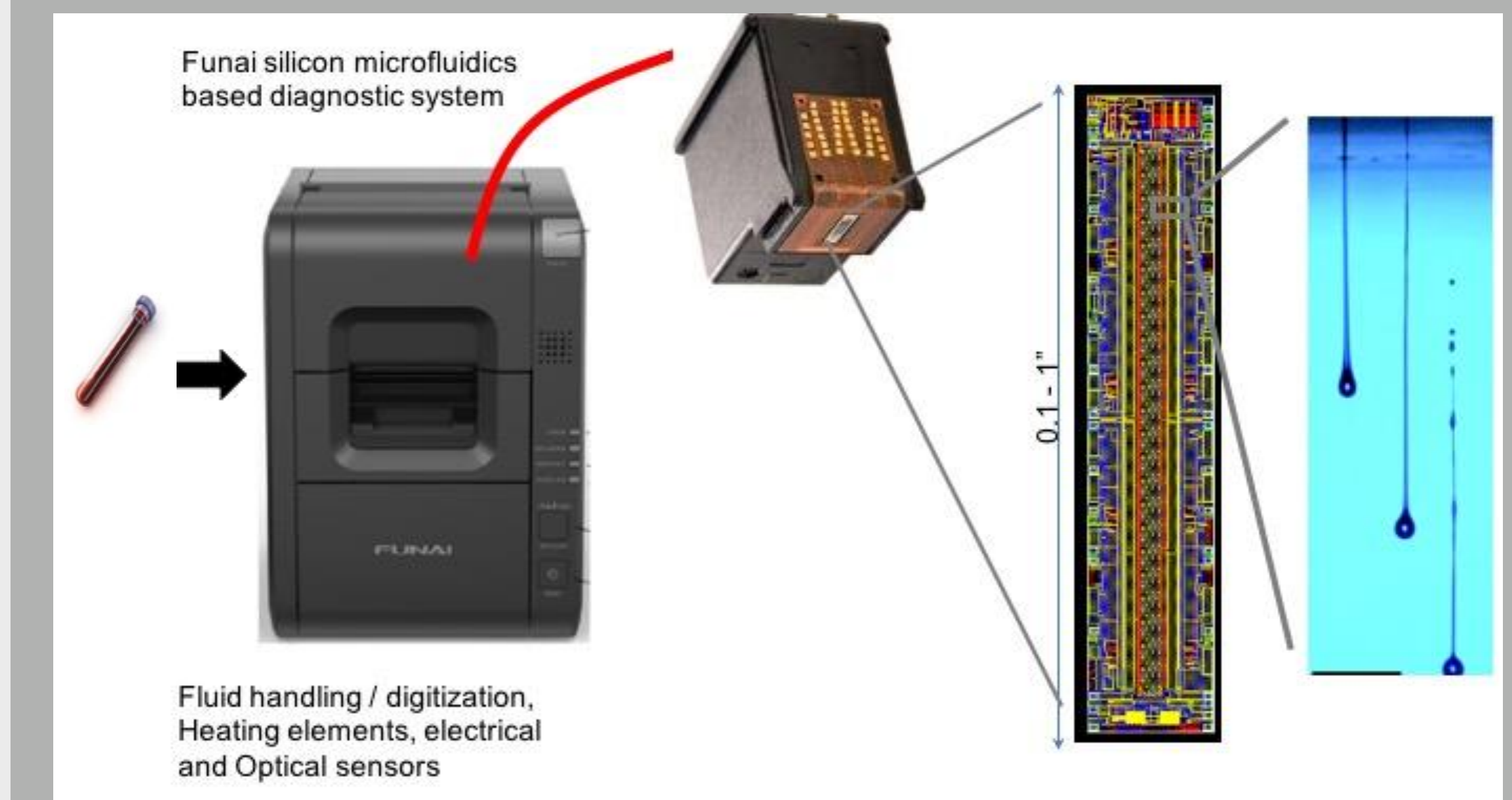


Figure 3: Integrated Funai process for cell analysis using silicon based microfluidics

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

