



# Fish on Chips

iFISH, a method for detecting changes  
in the genome and cancer detection

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# Outline

- General FISH Methodology
- Current Problems with current techniques for FISH
- U of Alberta Design
  - Time Saving
  - Cost Saving
  - Labour Savings
  - Comparable Accuracy



# FISH (Fluorescence in situ Hybridization)

- A cytogenetic technique to detect presence or absence of a specific DNA sequence
- Fluorescent probe is used to bind to chromosome at area of high similarity
- Useful in genetic counseling, medicine, and gene mapping
  - Highly specified identification of cancer type = highly targeted treatment

# FISH - Probes

- Prepare short sequences of Single Stranded DNA complementary to the sequence of interest
- Tagged with fluorophores with antibody targets



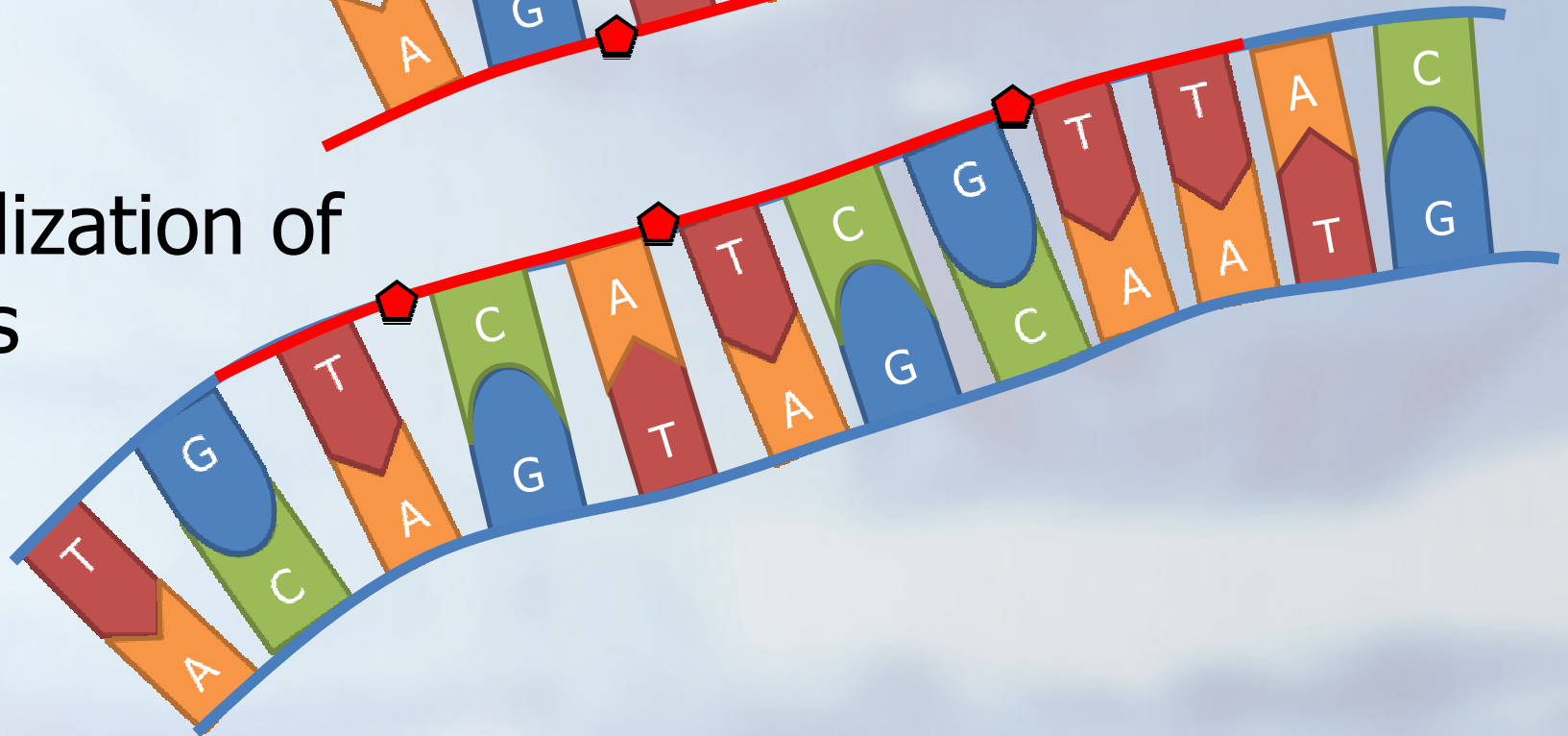


# FISH - Hybridization

Denature with Heat

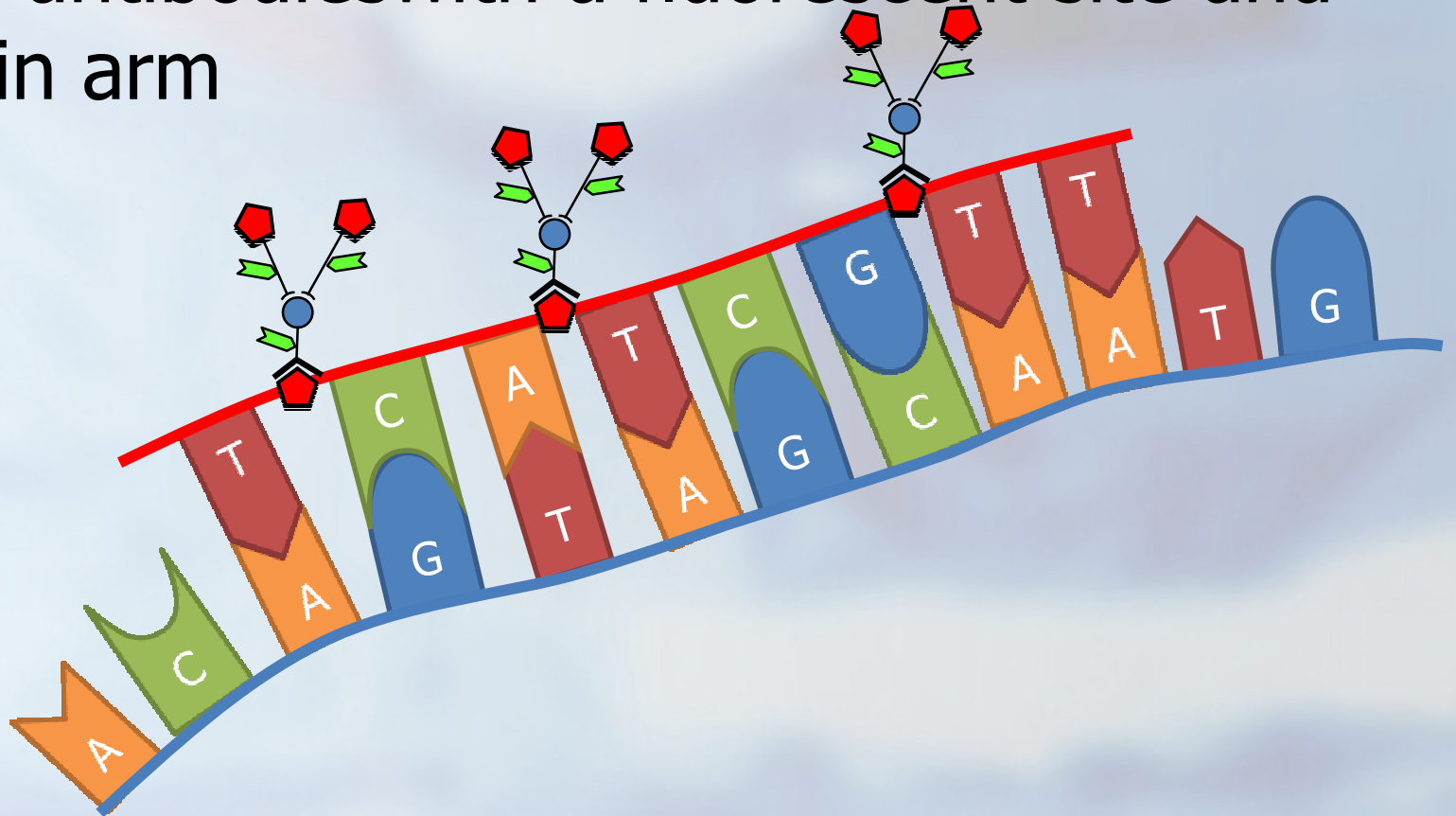


Hybridization of Probes

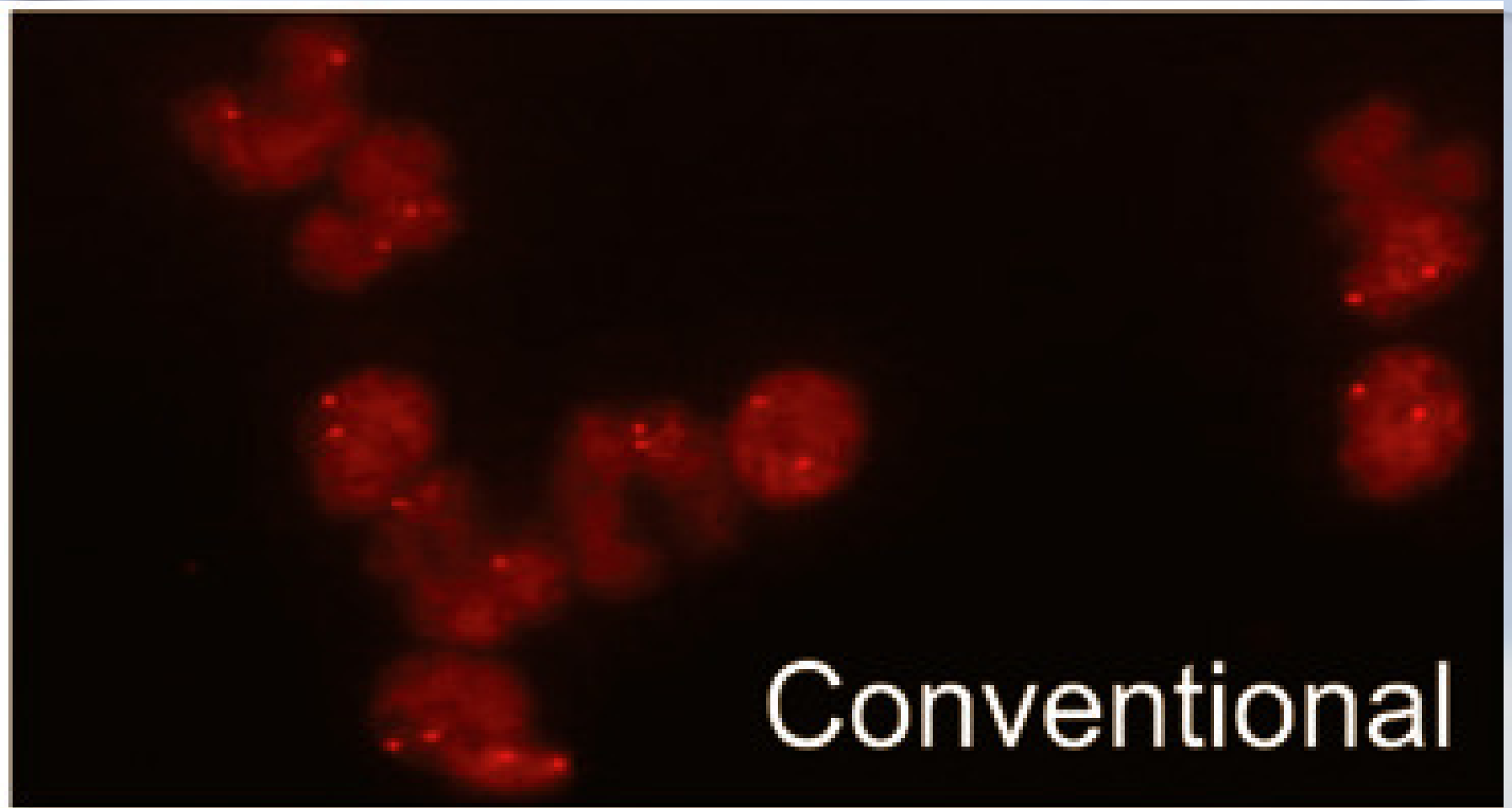


# FISH - Detection

- Fluorescent streptavidin molecules
- Molecules are then recognized by anti-spontaneously bind to modified nucleotidic avidin antibodies with a fluorescent site and a biotin arm



# Fish - Analysis



Conventional



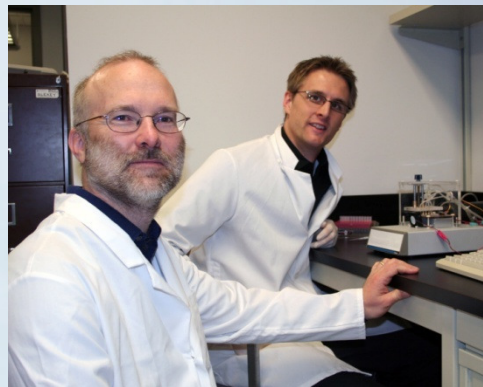
# Current Problems with Fish

- Probes are very expensive (~\$90 CDN for 1 test)
- Hybridization takes a long time
- High skilled labour costs to run the experiments
  
- But microfluidic chips can help in all these areas!

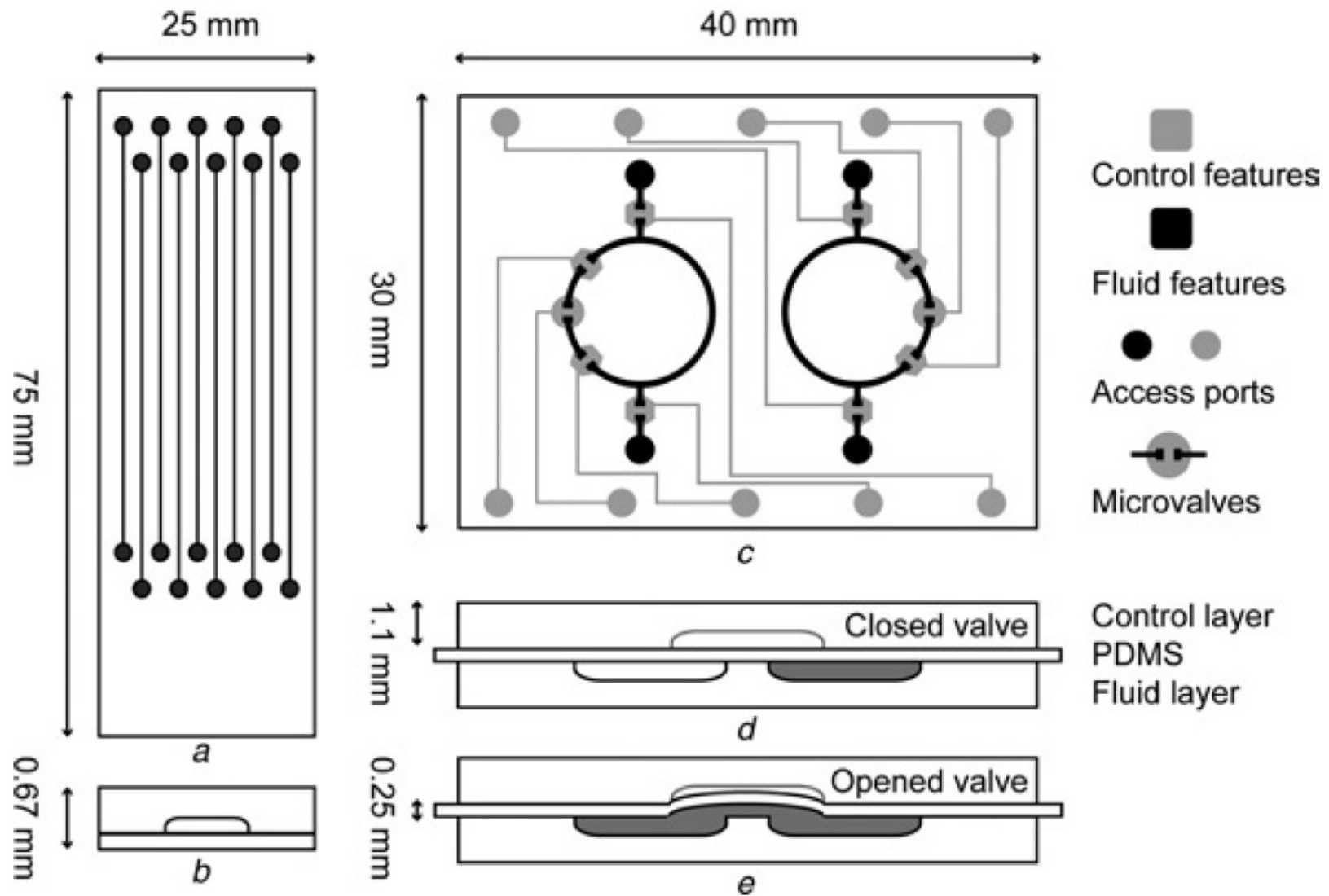


# Case Study – U of Alberta

- First design for potential widespread clinical use for cancer detection
- Use of Microfluidic chips helps to reduce cost, time while maintaining accuracy

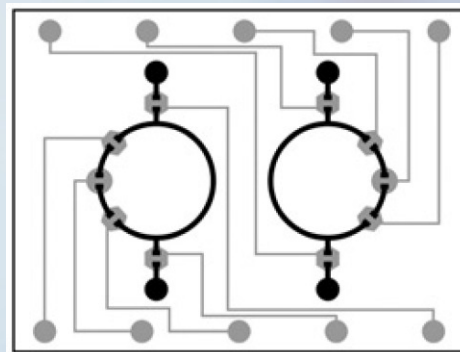


# Microfluidic Platform



# Time Savings

- Hybridization is the most time intensive part
- Solution:
  - fixate cells to the outer wall
  - circulating the probes in solution
- Reduced hybridization time up to 20 fold.





# Reduced Assay Costs

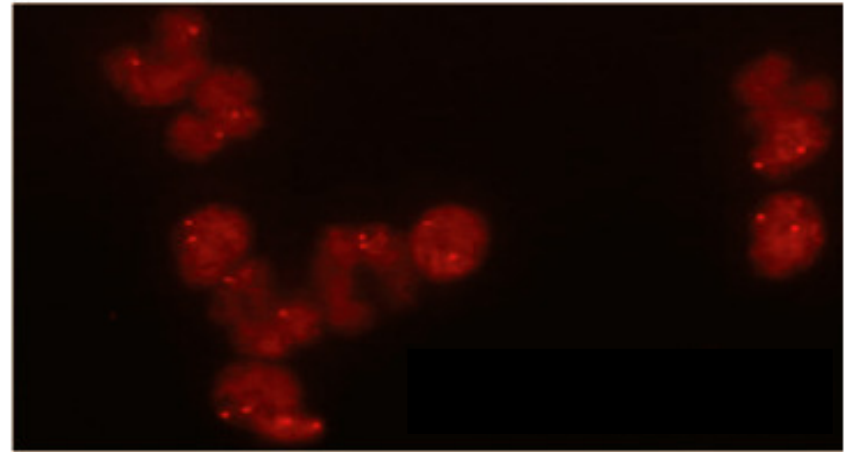
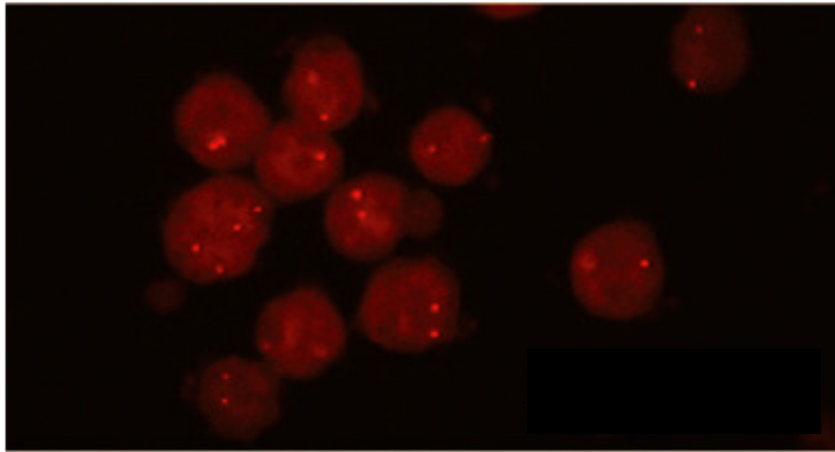
- Probes cost  $\sim$  \$90 per test
- Microfluidic chips use 1/10 the reagent
- Less dead space reducing reagent loss
- Huge savings just in the cost of the assay



# Labour Saving

- Reduced labour saving as each test takes less time
- Everything is on one chips, no need to mix and titrate or handle the slides
- Computer controlled requires users to only input cells, reagent, and perform microscopic analysis.

# Comparable Accuracy





# Recap

- Faster Hybridization
- Reduced Assay Costs
- Reduced Labour
- Comparable Accuracy
  - = Improved detection for a greater number of patients, improving their chances of successful treatment.



# Thanks!

- Questions?

