

# *SpinDx: rapid, sensitive, multiplexed biodetection*

Chung-Yan Koh

Senior R&D Scientist

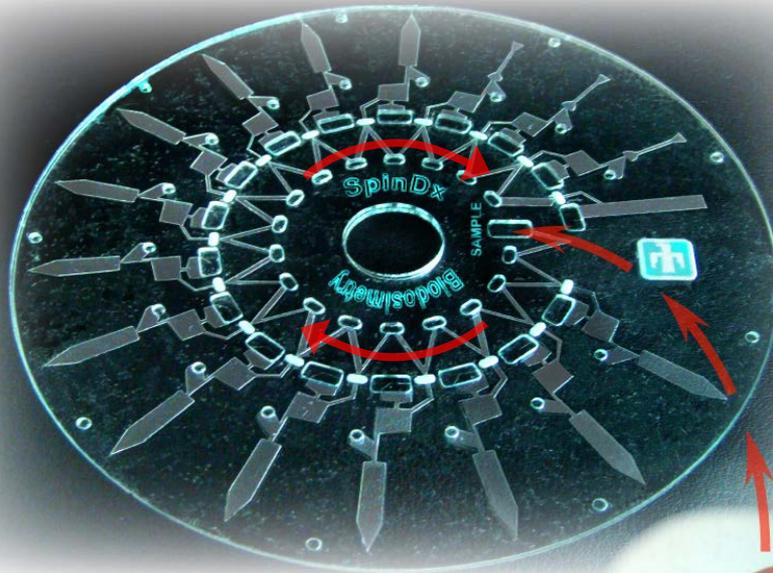
February 25, 2015

Sandia MedTech Showcase

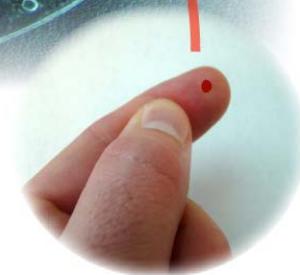
# Brief Technology Overview

Immunoassays

WBC Count



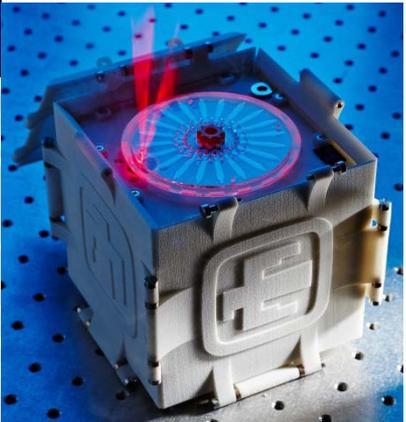
DNA assay



**Multiplexed quantitation:**

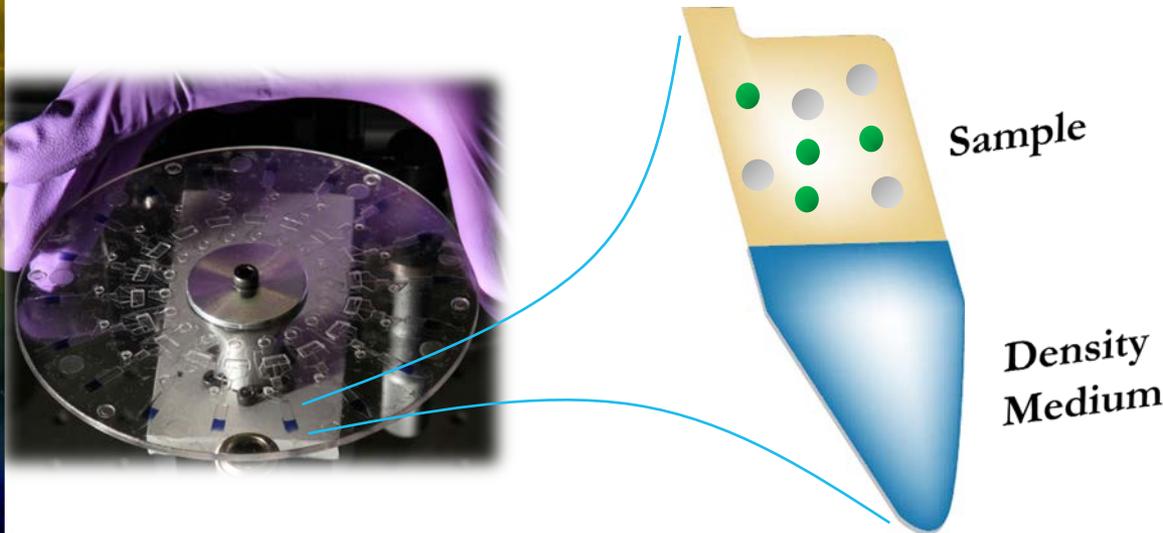
1. Proteins
2. DNA
3. Hematology

**Finger prick  
blood sample  
input (20-40 $\mu$ L)**



# Underlying Technology

## Sedimentation in centrifugal microfluidics



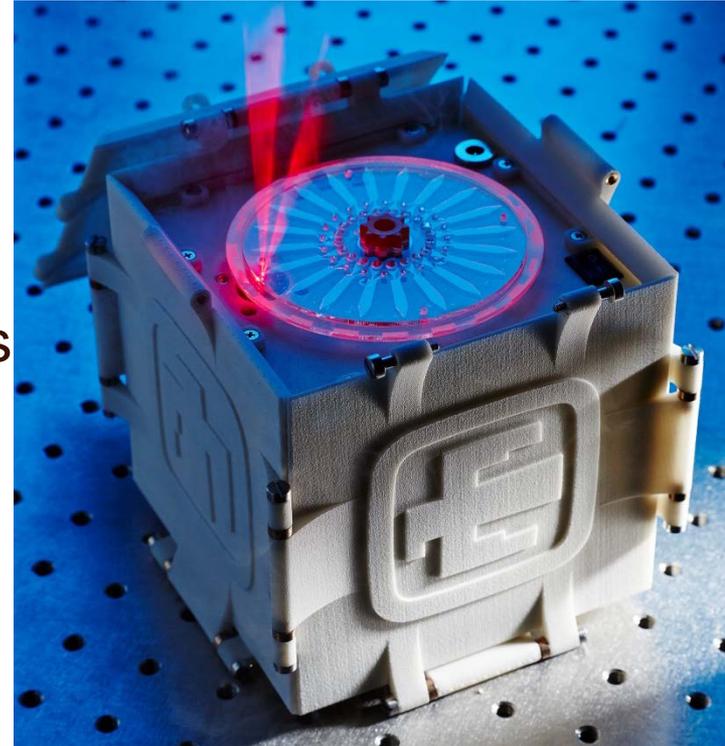
Particle transport governed by  
Stoke's Law:

$$U_s = \frac{2(\rho_p - \rho_f)}{9\mu} gR^2$$

On-disk separation of 3 bead populations of low, medium, and high densities (4500 RPM)

# Key Advantages

- **Fast:** Sample-to-answer in <15 min
- **Inexpensive:** <\$0.10 per assay, <\$2000 per instrument; manufacturable
- **Multiplexed:** up to 36 parallel assays
- **Sample sparing:** 2  $\mu\text{L}$  per assay
- **Sensitive:** 1-2 orders more sensitive than gold standards
- **No sample prep:** Direct analysis of samples including clinical (blood, serum, urine, saliva, stool) and environmental (white powder, food)
- **Flexible:** Proteins, nucleic acids, cells



**Portable:** 5" square,  
2 pounds, battery  
operated

# Differentiating factor from existing technology

---

- **Sedimentation:** Novel assays exploiting particle sedimentation
- **Ultra-sensitive:** Typically 1-2 orders of magnitude more sensitive than ELISA
- **Hematology:** Cell sorting and analysis in parallel with other on-disk assays
- **Speed:** 2-4 fold reduction in assay time (<15 min sample-to-answer)
- **Inexpensive:** 50-200 fold reduction in required reagent volumes
- **Minimally-invasive:** <20 $\mu$ L whole blood input (finger puncture)
- **Simple/robust:** Based on well-established physical principles requiring unsophisticated instrumentation
- **Easy to use:** Minimally trained operators
- **Flexible:** Screen one sample for a panel of targets or screen many samples for one target.

# Commercial Applications

---

- Point-of-care/Point-of-need clinical analyzer
  - Cancer diagnostics
  - Neonatal health
  - Fertility
- Public health/First responders
  - White powder analysis
- Biological research in high containment labs
- Agriculture (high value animal health)
- Food safety