

Abstract Submitted  
for the MAR13 Meeting of  
The American Physical Society

**Ultrasensitive Mirco-Hall Detector for Enumeration and Molecular Profiling of Rare Cells** CHANGWOOK MIN, Massachusetts General Hospital, DAVID ISSADORE, University of Pennsylvania, JAEHOON CHUNG, HUILIN SHAO, MONTY LIONG, AREZOU A. GHAZANI, CESAR M. CASTRO, RALPH WEISSLEDER, HAKHO LEE, Massachusetts General Hospital — We have recently developed a miniaturized microfluidic chip-based technology, the micro-Hall detector (uHD), that can perform rapid, highly sensitive, and quantitative measurement of individual cells in unprocessed biological samples. The uHD detects the Hall voltage induced by magnetic moments of cells in-flow that have been immunomagnetically tagged with magnetic nanoparticles (MNPs) and bio-orthogonal chemistry. The entire assay is performed on a single microfluidic chip with minimal sample preparation to avoid sample loss and to simplify assay procedure, eliminating the need for any washing and purification steps, and thereby allows cellular diagnostics to be conducted in point-of-care clinical settings. We also demonstrated simultaneous detection of heterogeneous biomarkers on individual cells by targeting different cellular markers with a panel of MNPs. The quantity of each MNP type, and hence the expression level of a target biomarker in a single cell, could be obtained using the particles' distinctive magnetization properties. The clinical use of the uHD was explored by the detection of circulating tumor cells (CTCs) in whole blood of 20 ovarian cancer patients, and drug treatment efficacy was monitored in a mouse tumor model.

Changwook Min  
Massachusetts General Hospital

Date submitted: 28 Nov 2012

Electronic form version 1.4