

Micro/nano-scale technologies for rare cell isolation and microphysiological systems engineering

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ABSTRACT: Microfluidic technologies have broad applications in rare cell isolation, stem cell purification for regenerative medicine, proteomic/genomic analyses, cancer research, and blood cell research, with down to single cell resolution and sensitivity. Microfluidic chip technologies that we have developed allow not only detection of rare cells in highly heterogeneous populations (e.g., CD4⁺ T-lymphocytes or CD34⁺ endothelial progenitor cells in blood), but also label-free isolation and retrieval with significantly enhanced sensitivity and specificity. We have applied advanced microfluidic technologies to multiple significant clinical problems: (i) CD4⁺ cell counting from fingerprick blood samples for monitoring HIV patients, which was clinically tested in Tanzania, Africa, (ii) neutrophil isolation and quantification from peritoneal dialysate for monitoring peritoneal dialysis patients for the risk of peritonitis, (iii) engineering 3D microenvironment of ovarian cancer metastasis to establish molecular alterations by physical and stromal cues that influence tumor heterogeneity, and (iv) complementary 'functional' complete blood count in sickle cell disease to interrogate cellular, membrane, and adhesive properties of red and white blood cells. Micro/nano-engineered strategies and technology platforms presented in this talk enable broad applications in fields including regenerative medicine, clinical diagnostics, pharmaceutical research, *in vitro* models of human diseases, and national security.

BIOGRAPHY: Dr. Gurkan received his PhD degree in Biomedical Engineering at Purdue and trained as a Postdoctoral Research Fellow in Medicine at Harvard Medical School and Harvard-MIT Health Sciences and Technology. His primary focus is developing micro/nano-scale technologies for biomanufacturing complex multiscale biological systems and microengineered methods for rare cell isolation and manipulation. Dr. Gurkan has received numerous research and teaching awards, including: IEEE-Engineering in Medicine and Biology Society Wyss Award for Translational Research, and Partners in Excellence Award for Outstanding Community Contributions. His research has been highlighted in numerous places including MIT News, McGovern Institute for Brain Research at MIT, Harvard-MIT Health Sciences and Technology, Science Daily, Wired News, Medica Magazine, Techies Magazine, Kurzweil News, Next Big Future, Innovation Toronto, Science Newslines, eScience News, Health Medicine Network, Zamais, Biology News Net, Terra Daily, Hurriyet News of Turkey, and China National News.



EVENT DETAILS

DATE:

October 23, 2013

TIME:

1:00 PM

LOCATION:

Carnegie 315
Stevens Institute of
Technology

ATTENDANCE:

Public