

*Fall 2016 Bioengineering Seminar Series*  
***Point-of-Care Screening and Monitoring of Sickle Cell Disease***

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**Abstract:**

SCD screening in newborns: 50-80% of the babies born with Sickle Cell Disease (SCD) in low-resource countries die before the age of 5 due to lack of diagnosis. The World Health Organization estimates that at least 70% of these deaths are preventable with simple, cost-efficient interventions, such as early diagnosis by newborn screening followed by standard treatment and care. To address this unmet need, we developed a new point-of-care (POC) HemeChip technology to screen newborns for SCD. HemeChip is POC translation of the electrophoresis method, which is a current standard in SCD screening. HemeChip technology promises to break the diagnostic barrier in low-resource settings, by providing an affordable, robust, easy-to-use, POC platform for newborn screening of SCD and other hemoglobin disorders. In this talk, I will present the results of our clinical validation studies in Cleveland, OH, in Oakland, CA, and will provide an overview of our upcoming field testing in Sub-Saharan Africa.

SCD monitoring in adults: SCD affects millions worldwide, and imposes significant physical, emotional and financial burdens on its sufferers and their families and communities. SCD can cost more than \$8 million per patient over a 50 year life-span (in the United States). To reduce the physical and financial burden of SCD, and to develop improved individualized treatment strategies, we need better monitoring modalities in SCD akin the POC blood glucose testing in diabetes. Even though abnormal RBC adhesion is the centerpiece of vaso-occlusion and vascular damage in SCD, there is no clinically applicable tool or method to evaluate RBC adhesion as a clinical biomarker for disease severity. Better knowledge of the nature and scope of abnormal adhesive events is critical to the goals of establishing associations with clinical outcomes and successfully identifying therapeutic targets in clinical trials, for example in the case of anti-adhesion drugs. To address this unmet need, we developed a versatile microfluidic biochip platform (SCD BioChip) for objective quantification of RBC adhesion in whole blood samples. SCD BioChip provides a new, clinical, in vitro functional assay for monitoring SCD disease activity, at baseline, during crises, relative to various long-term complications, and before and after therapeutic interventions. In this talk, I will present our early results on clinical testing of this new monitoring technology with 100+ patients, which was performed in a busy urban SCD clinic in collaboration with Adult Sickle Cell Anemia Center at Unv Hospitals.

**Where:** SSOE Seminar Room, NI 1027

**When:** December 9<sup>th</sup>, 2016

**Time:** 12:00 – 1:00 pm

**Bio:** Dr. Gurkan holds a PhD degree in Biomedical Engineering from Purdue University. He completed his postdoctoral training in medicine at Brigham and Women's Hospital, Harvard Medical School and Harvard-MIT Health Sciences and Technology after which he joined CWRU as Assistant Professor. Dr. Gurkan is leading the CASE Biomanufacturing and Microfabrication Laboratory (CASE-BML). CASE-BML's mission is to improve human health and quality of life by a fundamental understanding of cell biomechanics, and through innovations in micro/nano-engineering, microfluidics, biosensors, and point-of-care systems. Dr. Gurkan has received national and international recognitions and awards for research and education, including, (1) NSF CAREER Award, (2) "Rising Star" Award from Biomedical Engineering Society (Cellular and Molecular Bioengineering and Advanced Biomanufacturing Divisions), (3) MIT Technology Review Innovator Under 35 Award (Turkey), (4) Case-Coulter Translational Research Partnership Award, (5) Clinical and Translational Science Collaborative Award, (6) Case School of Engineering Research Award, (7) Doris Duke Innovations in Clinical Research Award, (8) Belcher-Weir Family Pediatric Innovation Award, and (9) Glennan Fellowship from the University Center for Innovation in Teaching and Education. Dr. Gurkan has authored over 50 articles in peer-reviewed journals, numerous book chapters and patents.