Application of Nanoengineered Materials in Translational Molecular Diagnosis

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Screening, diagnosis, prognosis and treatment evaluation of malignant and infectious diseases often requires biomarker analyses, but restrictions imposed by current invasive or labor-intensive procedures can limit disease detection and management efforts. Noninvasive diagnostic and prognostic assays are needed to address these issues, but their development is inhibited by low biomarker concentrations, or lack of known biomarker targets, in such samples. To address these needs, my laboratory employs advanced proteomics and engineered nanomaterial platforms to discover and validate new functionally selected disease biomarkers and to develop and validate novel assays that analyze minimally invasive samples to cover the entire spectrum of disease evaluation, including: 1) diagnosis of early disease and assessment of infectivity; 2) discrimination among specific disease stages (e.g., latent, activating, and active infections) or prognoses (e.g., treatment failure, drug resistance, or metastasis); 3) evaluation of microbial, chronic or malignant disease burden for treatment monitoring; and 4) early detection of drug resistance and toxicity, including that drug and radiation induced toxicity. My long-term goal is to develop clinical applications for human diseases with unmet diagnostic or prognostic needs. Achieving this goal would provide crucial and timely information for therapeutic decisions required in the practice of personalized medicine, which is expected to improve patient outcomes.

Dr. Tony Hu joined Tulane University School of Medicine as the Weatherhead Presidential Chair in Biotechnology Innovation, and leads the School of Medicine’s newly created Center of Cellular and Molecular Diagnosis. He also serves as a professor in the departments of Biochemistry & Molecular Biology, Tulane National Primate Center, and Biomedical Engineering. His research focuses on developing and validating highly sensitive blood tests that rely on nanotechnology-based strategies to find previously undetectable biomarkers of diseases. Hu received his PhD in biomedical engineering from the University of Texas at Austin where he focused on developing nanomaterials as biosensors for disease diagnosis. He has published more than 70 journal articles and has received 10 U.S. and international patents in this area since his first faculty appointment in 2011. Three of his innovations have been licensed by US-based companies and are under development for commercialization. Dr. Hu previously served as professor at the Biodesign Institute at Arizona State University’s Virginia G. Piper Center for Personalized Diagnostics and at ASU’s School of Biological and Health Systems Engineering.