



“Nanopore-based Assay for Disease Biomarker Detection and Discovery”

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LECTURE: 9:00 AM—10:00 AM

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Abstract: Without a blood-based biomarker, the current method for diagnosing cancer diseases is mostly limited to costly imaging, such as CT or MRI. Despite recent advances in molecular biology, no clinically approved biomarker has been found due to lack of specificity and sensitivity. Furthermore, imaging is also used to determine therapeutic efficacy of tumor treatments, but sometimes imaging is not sensitive enough to show early response of tumor and development of resistance to therapy. However, studies have shown that tumor cells undergoing apoptosis immediately release cell components into cell culture media. Building upon the in vitro models, the proteome of a blood samples can be used as basis for a discovery of biomarker which is released from the tumor cells undergo apoptosis and is correlated to treatment efficacy. Previous studies have examined cancer biomarkers, but the method of fractionation of serum samples utilized in these studies involved commercially available protein profiling kits, and the identification of these biomarkers has revealed only high molecular weight, acute phase proteins and their components at high concentration. Here, we present the use of novel nanoporous silica chips to enrich low molecular weight proteins for cancer biomarker discovery. The circulating low molecular weight proteome (LMWP), composed of small proteins shed from tissues and cells or peptide fragments derived from the proteolytic degradation of larger proteins, has been associated with the pathological condition in patients. The serum from mice models with primary breast cancer, lung metastasis breast cancer and melanoma cancer were processed by our nanopore-based array to identify specific biomarkers or patterns of biomarkers that can be correlated to tumor progression. By matrix-assisted laser desorption/ionization, time-of-flight mass spectrometry (MALDI-TOF MS) and principle component analysis, we were able to identify low molecular weight protein signatures unique to different stages of cancer development. Thus, this nanotechnology-based approach should enable the reliable and cost-effective quantification of hepcidin levels and holds great promise as a means to clinically assess a broad range of disease states related to the tumor progression and evaluate therapeutic efficacy.

Biography: Tony Y Hu Ph.D is an assistant professor in the department of Nanomedicine at the Methodist Hospital Research Institute. He is also an assistant professor in the department of cell and developmental biology at Weill Cornell Medical College of Cornell University. Dr. Hu received his PhD in Biomedical Engineering from the University of Texas at Austin where he specialized in developing nanomaterials as biosensor for diseases diagnosis. Dr. Hu brings a diverse background in Chemistry, Nanofabrication and Biomedical Engineering. He has worked in the development and manufacturing of nanoporous silica devices and their application in biomarker discovery and validation for years. As a new faculty member, Dr. Hu has co-authored over 20 leading publications, 4 book chapters and 4 patent applications involving nanomedicine since 2010.

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