Assessing Interstitial Fibrosis and Tubular Atrophy (IFTA) Using Minimally-Invasive Elastic Scattering Spectroscopy as an Indicator of Kidney Health

Team 6: **Giulia Boccardo, Ji Young Chung, Meghan Howard. Emily Oros**
Technical Advisors: **Ousama A'amar, Irving Bigio**

Chronic Kidney Disease (CKD) is a serious illness characterized by diminished kidney function that affects about 1 in 7 US adults. It consistently results in required dialysis and eventually kidney transplant(s). Currently, assessing the health of kidneys for transplant involves reviewing the deceased's medical record history and physically examining the organ ex vivo. The current gold standard of CKD diagnosis involves measuring the extent of IFTA through a kidney biopsy, a risky procedure involving a large needle with many drawbacks. Therefore, there is a pressing clinical need for a method to rapidly measure and assess IFTA for both the allocation of transplant kidneys and treatment of CKD without the guesswork or tissue damage. Our team has designed, built, and tested a minimally invasive fiber optic probe to measure the viability of kidney function. Our probe incorporates elastic-scattering spectroscopy (ESS) which measures backscattered light over the 300-900 nm range. We have tested our device on unlabeled tissue of an adenine rat model of CKD and were able to find correlation between disease progression and changes in the measured ESS spectra. The results were observed spectral trends of decreased slope of scattering intensity in the near-UV to short-visible region (300–500 nm), relative to longer wavelengths, for fibrotic kidneys compared to normal kidneys. The results of this study will demonstrate the potential of ESS technology as a more accurate, rapid, and non-invasive assessment of IFTA for potential donor kidneys and its application for in vivo procedures.