Raman Fiber Optic Probe for Fat Content Analysis: Assessing Sensitivity and Specificity

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Due to increasing obesity and associated non-alcoholic fatty liver disease, there is a greater demand for liver transplantation and concomitantly surgeons have had to relax the criteria for donor livers to include those that are fatty. The current standard of practice, a visual observation of how stiff or yellowish the liver is - is rudimentary at best. We want to develop a device that can quickly determine fat content and give a real-time result as to whether a liver is viable for transplantation. A Raman fiber optic probe has been previously created in our group to analyze fat content, we now assess the sensitivity and specificity using lipid-water phantoms of varying fat concentrations. The maximum voltage was measured for multiple phantoms and spectra were also obtained using FT-Raman spectrometer. The measurements with the prototype had a strong correlation ($\chi = 0.99$) with fat content for phantoms of 0, 25, 50, 75, and 100 %, and showed promising sensitivity ($\chi = 0.83$) for the phantoms in the 0-5 % region, but could still use improvement in S/N.