Reflectance Measurements of Photosensitized Tissue Phantoms
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Abstract
A long-term goal for our research group is to develop a non-invasive optical method to determine the photosensitizer content of tissues in vivo. The absorption spectra of blood and porfimer sodium is very similar in the visible region, making it difficult to detect the presence of therapeutic amounts of porfimer sodium with optical methods. We are currently experimenting with measurements of fiber optic reflectance of tissue phantoms in order to determine the effect of known amounts of photosensitizer (porfimer sodium) on reflectance spectra. The experimental setup includes a fiber optic bundle that is used for light delivery and collection, a halogen lamp and an Ocean Optics fiber optic spectrometer. The tissue phantom is composed of bovine blood, intralipid and saline. The blood volume is varied from 0.5 mg/kg to 10 mg/kg. The reflectance spectra will be analyzed with multi-component analysis.

Preparation of tissue phantoms
Tissue phantoms were made with 5% to 9% per volume bovine blood, intralipid, saline, and Photofrin concentrations of 0.5, 1.0, 2.0, 2.5, and 3.0μL/mL
• All light sources in the lab were turned off to avoid light exposure to the photosensitizing agent.
• The reflectance of the solution was measured using a fiber optics cable

Data

Figure 2. Reflectance of the tissue phantoms with 6% and 7% blood and varied amounts of Photofrin. There is no significant correlation between reflectance and Photofrin concentration.

Conclusion
The reflectance spectra collected for the experimental tissue phantoms composed of 5 to 9% blood and varying concentrations of Photofrin provided no conclusive results. There is no significant correlation between the reflectance of the phantoms and the Photofrin concentration. When compared to the reflectance spectra of the human esophageal tissues, the experimental reflectance did not resemble the human samples. This is indicative that the use of reflectance to measure a single layer tissue phantom is not an appropriate evaluation of actual human tissues. In future experimentation a multilayer tissue phantom will be used to more accurately model the esophageal tissues of humans.