H. Shangguan, L. W. Casperson, S. A. Prahl, "The effect of absorption coefficient and radiant exposure on the threshold of cavitation bubble formation in light absorbing liquids," *Proceedings of the Oregon Academy of Science*, **31**, pp. 51, (1995).

Abstract: We have recently demonstrated that laser-induced cavitation bubbles in medicated liquids can drive drug into tissues. To establish the minimum laser energy required to deliver pharmaceuticals with this technique, we measured the effect of absorption and radiant exposure on the cavitation bubble thresholds. One microsecond laser pulses were delivered through optical fibers with diameters of 300–1000 μm. Absorbing solutions of either D&C Red #17 in mineral oil or Direct Red 81 in distilled water were prepared such that the absorption coefficient varied from 50–300 cm^{-1}. A bottle (52×52×42 mm) filled with an absorbing liquid was placed on an acoustic transducer. An acoustic signal due to the cavitation bubble formation was detected by the transducer. Bubbles were created at the fiber tip located inside the solution 2 cm from the surface and 2.5 cm from the bottom. The threshold energy was defined as the energy required to produce a signal of 11 mV peak-peak on an oscilloscope. These acoustic measurements were verified by flash photography. Conclusions: 1) Increasing the absorption coefficient and radiant exposure reduces the threshold energy non-linearly. 2) The threshold energy for water is higher than that for oil. 3) The ratio of two fiber diameters is equal to the ratio of two corresponding threshold radiant exposures. 4) The ratio of the maximum bubble height and the fiber diameter at the threshold was nearly equal for all measurements.