

NIR-TPE Photobleaching Dynamics of VP in Vesicles

Matthew S. Fecica, Dr. D. T. Cramb, Kim Samkoe

**University of Calgary
University of Waterloo**

The photochemistry of Verteporfin (VP) in liposomal solutions of dioleoyl-phosphatidylcholine (DOPC) has been examined using near infrared two-photon excitation (NIR-TPE). The combination of liposomal drug delivery with NIR-TPE allows photodynamic therapy with reduced toxicity and highly localized light dosage, respectively. The Challenges involved in examining the photobleaching kinetics for membrane bound Verteporfin will be discussed. The development of liposomal optical trapping was used to survey a heterogeneous solution with a focal volume on order of $\sim 1 \mu\text{m}^3$. This technique allowed for the isolation of liposomes with a diameter on the order of the incident radiation $\sim 0.5 \mu\text{m}$. Fitting of the photobleaching data revealed that in the model solution ($1.0 \text{ mg DOPC}:0.01 \text{ mg VP mL}^{-1}$) a double exponential decay function best described the observed photobleaching dynamics. Comparably the rate constants were greater than rate constants previously determined by our group for Triton X-100 micelle solutions. Variability in the determined rate constants can be explained in terms of proposed differences in local oxygen availability as a function of vesicle size. This work has outlined the fundamental basis for future investigations regarding the photobleaching dynamics of VP in liposomes.