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Simulating light propagation in brain tissue using ray tracing THOMAS SAUER, WINSLOW COTTON, PEIFANG TIAN, John Carroll University, ANNA DEVOR, ANDERS DALE, University of California, San Diego, LANA RUVINSKAYA, DAVID BOAS, SAVA SAKADZIC, Massachusetts General Hospital, UNIVERSITY OF CALIFORNIA, SAN DIEGO COLLABORATION, MASSACHUSETTS GENERAL HOSPITAL COLLABORATION — The advent of two-photon fluorescence microscopy (TPFM) has opened great opportunities in neurosciences. However, data interpretation of TPFM on dyes with small signal changes such as beta-nicotinamide adenine dinucleotide (NADH) face enormous challenges because the measured signal change is distorted by hemodynamic changes. Prior work by Baraghis et al corrected for this using a single value found empirically. We calculate the point to point correction factor using a 3D microvasculature and check the validity of the single value correction scheme. We use ray tracing scheme to simulate two-photon fluorescence and consider light scattering and absorption due to blood vessels. We calculated the correction factors of NADH signal in a rat model and found that the correction factor was homogeneous beyond 140 microns below the cortical surface, indicating that a single value correction scheme may be adequate in deeper tissues. We will present our new results on a mouse model to test the generality of the single value correction scheme. Our study allows more accurate interpretation of functional imaging studies.

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