FLIM and Spectral phasor approaches for imaging drug delivery by nanoparticles.

Alex Macmillan¹, Hien T.T. Duong², Elizabeth Hinde³, Cyrille Boyer² & Renee Whan¹
¹Biomedical Imaging Facility, University of New South Wales, Australia, 2052
²Australian Centre for Nanomedicine and Centre for Advanced Macromolecular Design
School of Chemical Engineering, University of New South Wales, Sydney, Australia, 2052
³Centre for Vascular Research, University of New South Wales, Sydney, Australia, 2052
Email: alex.macmillan@unsw.edu.au

Keywords: Fluorescence lifetime imaging, spectral unmixing, phasor analysis, nanoparticle, drug delivery

Recent publications have illustrated the advantages of fluorescence lifetime imaging (FLIM) and phasor analysis to monitoring drug delivery by nanoparticle [1-3]. FLIM has provided a means to directly monitor and demonstrate time-release of the anti-cancer drug Doxorubicin (DOX) from polymeric and iron nanoparticles. Importantly, it allows us to distinguish between the free and conjugated doxorubicin localisation within live cells. Phasor analysis provides an alternative to the more complicated traditional exponential fitting of data which can be difficult to interpret when multiple components are present [4]. Although, FLIM phasor analysis simplifies the previously “expert only” technique, it still requires pulsed laser sources and expensive timing electronics in order to record the time delays at each pixel of the FLIM image. In this presentation we will discuss the advantages to FLIM phasor analysis for nanoparticle drug delivery and furthermore discuss alternatives to monitoring drug release based on spectral phasor analysis [5] which can be implemented on confocal microscopes with spectral detectors.