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Ultra-sensitive, time-gated luminescence detection of immune-labelled prostate cancer cells using a novel biocompatible europium ligand

Rapid, sensitive and non-invasive diagnostic testing for cancer has the potential to lead to better treatment outcomes and lower healthcare costs. The required sensitivity for such tests can require the detection of as few as ten cells within 10 ml of biofluid. Current tests fall far from the ideal limits of detection required in clinical settings. A fundamental problem in the detection of cancer cells with conventional fluorescence probes is the poor signal to noise ratio due to the presence of high autofluorescence. Time-gated luminescence (TGL) probes eliminate the problem of autofluorescence to make TGL one of the most sensitive fluorescence detection methods known. Unlike organic fluorophores, lanthanide conjugated bio-molecules are not susceptible to self-quenching. As a result, high signal amplification can be achieved by multiple labeling of the biomolecule of interest, although this approach can be problematic since it often results in precipitation of labeled biomolecules. We have recently reported a novel europium ligand which offers enhanced biocompatibility of immunoconjugate and retains selectivity and stability over that previously reported (DOI:10.1039/C5CC06811H). An analogue ligand with improved quantum yield was successfully synthesized and coupled to a prostate cancer cell-specific IgG antibody (MIL38) provided by our collaborator (Minomic International Ltd.). Direct conjugation of the new ligand to MIL38 resulted in a soluble immunoconjugate probe which effectively labeled cultured prostate cancer cells (DU145). TGL microscopy (GALD) delivered images of brightly labeled cells free of background.

Biography

Nima Sayyadi is a Research Fellow at the Department of Chemistry and Biomolecular Sciences (CBMS), Macquarie University, Australia. He received his PhD from the University of Sydney, School of Chemistry. In his PhD a new methodology for the synthesis of natural and non-natural small cyclic peptides was developed. After completion of his PhD, he moved to Macquarie University, where he accepted a Post-doctoral position at CBMS. Since then, he has designed and developed a series of novel Europium Luminescent Chelates for the detection of bacterial and cancer cells using different platforms such as Luminescent in situ Hybridization (LISH) and Immunostaining in collaboration with the Centre of Excellence in Nanoscale BioPhotonics (CNBP) at Macquarie University.

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