World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:11, No:07, 2017

Europium Chelates as a Platform for Biosensing

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Abstract : Rare earth nanotechnology has gained a considerable amount of interest in the field of biosensing due to the unique luminescence properties of lanthanides. Chelating rare earth ions plays a significant role in biological labelling applications including medical diagnostics, due to their different excitation and emission wavelengths, variety of their spectral properties, sharp emission peaks and long fluorescence lifetimes. We aimed to develop a platform for biosensors based on Europium (Eu^{3+}) chelates against biomarkers of cardiac injury (heart-type fatty acid binding protein; H-FABP3) and stroke (glial fibrillary acidic protein; GFAP). Additional novelty in this project is the use of synthetic binding proteins (Affimers), which could offer an excellent alternative targeting strategy to the existing antibodies. Anti-GFAP and anti-HFABP3 Affimer binders were modified to increase the number of carboxy functionalities. Europium nitrate then incubated with the modified Affimer. The luminescence characteristics of the Eu^{3+} complex with modified Affimers and antibodies against anti-GFAP and anti-HFABP3 were measured against different concentrations of the respective analytes on excitation wavelength of 395nm. Bovine serum albumin (BSA) was used as a control against the IgG/Affimer Eu^{3+} complexes. The emission spectrum of Eu^{3+} complex resulted in 5 emission peaks ranging between 550-750 nm with the highest intensity peaks were at 592 and 698 nm. The fluorescence intensity of Eu^{3+} chelates with the modified Affimer or antibodies increased significantly by 4-7 folder compared to the emission spectrum of Eu^{3+} complex. The fluorescence intensity of the Affimer complex was quenched proportionally with increased analyte concentration, but this did not occur with antibody complex. In contrast, the fluorescence intensity for Eu^{3+} complex increased slightly against increased concentration of BSA. These data demonstrate that modified Affimers Eu^{3+} complexes can function as nanobiosensors with potential diagnostic and analytical applications.

Keywords : lanthanides, europium, chelates, biosensors
Conference Title : ICNNN 2017 : International Conference on Nanobiotechnology, Nanodevices and Nanodrugs
Conference Location : Rome, Italy
Conference Dates : July 17-18, 2017