

A Fluorescent Heterobimetallic Ir(III)-Pd(II) Complex (HBMC) Selectively Images Cancer Cells



Debashree Das^{1,2}, Sampurna Bhattacharya³, Adhir Majumder¹, Pallabi Roy¹, David Morgan⁴, Ramananda Maity¹, Kamalika Sen^{1*}

¹Department of Chemistry, University of Calcutta, 92 APC Road, Kolkata, India

²Department of Chemistry, Bharat Institute of Engineering & Technology, Hyderabad, India

³Department of Biophysics, Molecular Biology & Bioinformatics, University of Calcutta, 92 APC Road, Kolkata, India

⁴Cardiff Catalysis Institute, School of Chemistry, Cardiff University, Park Place, Cardiff CF10 3AT, UK

Early detection and treatment of cancer cell is the only way to eradicate cancer in patients and this can be efficiently achieved via fluorescence imaging technique. Henceforth, we present a fluorescent heterobimetallic complex (HBMC) of Ir(III)/Pd(II) which selectively images the nucleus of the cancer cells over normal cells at a very low concentration (12 μ M), established by confocal laser scanning microscopy. HBMC has a unique property by virtue of which it is selectively taken up by cancer cells (HeLa) and hence allows selective imaging of cancer cells over normal cells (HaCat). However, the subunits of HBMC, i.e., homonuclear Ir(III) and Pd(II) complexes are ineffective in imaging cancer cells. HBMC showed pH dependent uptake into HeLa cells followed by its subsequent localization in nucleus, supported by fluorescence microscopy. The possible reason behind its selectivity towards cancer cells is its interaction with a protein of ~44 KDa molecular weight as obtained from mass spectrometric analysis. Bioinformatics study predicted the protein of ~44 KDa molecular weight as serotonin receptor, 5-HT, overexpressed in HeLa cells. Moreover, HBMC is also found to interact with DNA with a sequential binding pattern and the interaction of DNA with HBMC has been established by fluorescence spectroscopy, isothermal calorimetric titration, and theoretical studies as well. Hence, our low-cost fluorosensor may have dual applicability in early diagnosis of patients having cancer and therapeutic approach as DNA binder.

Keywords: Heterobimetallic complex; Cancer cell-imaging; Confocal microscopy; Fluorescence spectroscopy; DNA binding

Biography:

Dr. Debashree Das is an assistant professor in Department of Chemistry in Bharat Institute of Engineering and Technology, Telangana, India. She did Ph.D. in Chemistry at Saha Institute of Nuclear Physics under Prof. Abhijit Chakrabarti and her thesis title is "Spectrin and membrane interactions of heme and heme proteins". Dr. Das has 8 years of postdoctoral experience in Analytical Chemistry, Biophysical Chemistry, Nanotechnology etc. Dr. Das has published 20 research articles and 1 book chapter in the international journals of repute. She has been awarded 6 national fellowships for PhD and Postdocs.