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Notice for the PhD Viva Voce Examination

Mr Vijay Jha Pillai (Reg. No. 1347201), PhD scholar at CHRIST (Deemed to be University), will defend his PhD thesis at the public viva-voce examination on Thursday, 24 June 2021 at 3.30 pm on the WebEx Meeting platform.

Title of the Thesis	:	**Fluorescence Diffuse Optical Tomography: Synthesis, Characterization and Imaging of a Novel Target Specific Near Infra-Red Contrast Agent for Breast Cancer Detection**
Discipline	:	**Electronics and Communication Engineering**
External Examiner (Outside Karnataka)	:	**Dr S Chiplunkar** Professor & Director TATA Memorial Centre Advances Centre for Treatment, Research and Education in Cancer Kharghar Navi-Mumbai – 410210 Maharashtra
External Examiner (Within Karnataka)	:	**Dr N Sriram** Professor and Head Department of Medical Electronics Ramaiah Institute of Technology Bengaluru -560054 Karnataka
Supervisor	:	**Dr Iven Jose** Professor Department of Electronics and Communication Engineering School of Engineering and Technology CHRIST (Deemed to be University) Bangalore Kengeri Campus Bengaluru - 560074

The faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva.

Registrar

Place: Bengaluru
Date: 21 May 2021

ABSTRACT

Contrast agents are finding profound application in optical imaging of breast cancer for an early detection. In the present work, a novel estrogen receptor (ER) targeted near infra-red fluorescent dye conjugate was synthesized, referred to as Novel Dye Conjugate (nDC) hereafter. nDC is a conjugate of 17β-estradiol with a derivative of indocyanine green dye, bis-1,1-(4-sulfobutyl) indotricarbocyanine-5-carboxylic acid, sodium salt. Structural composition of nDC was validated using Liquid Chromatography–Mass Spectrometry (LC-MS) and Hydrogen-1 Nuclear Magnetic Resonance (1H-NMR) technique. MCF-7 and MDA MB 231 Cell lines studies proved the special biding ability of nDC with estrogen receptor positive breast cancer cell lines and its photophysical properties were verified to be in near infrared region (NIR). Similar studies were conducted on ER expressing cancerous tissues like Non-Invasive Ductal Carcinoma, Non-Invasive Lobular Carcinoma, Non-Invasive Adenocarcinoma and Non-Invasive Medullary Carcinoma. In all the above tissues, nuclear level ER binding of nDC was observed leading to the validations of the unique binding properties of the novel dye.

Mathematical modeling for tumor to background mapping using nDC was carried out through Fluorescence Diffuse Optical Tomography (FDOT) simulations. Simulation results were also validated using silicone phantom experiments. An array of 8*8 boundary data was collected using frequency domain-FDOT system which was setup indigenously. Commercially available fluorescent dye Indocyanine Green (ICG) was used in the present study for comparative analysis with nDC. When compared to ICG, proposed dye had 1.5-fold higher target to background contrast with respect to fluorescent lifetime in both simulation and phantom studies. Similarly proposed novel dye had a two-fold higher target to background contrast with respect to fluorophore absorption. Above results proved the superiority of nDC compared to ICG on target(tumor) to background ratio enhancement. In conclusion the NIR fluorescent properties, cancer cell lines & tissue studies and their validation on phantom models, proves nDC to be a potential probe for the early tumor detection through molecular imaging.

Keywords *- breast cancer, estrogen receptors, NIR, florescent dye, Fluorescence Diffuse Optical Tomography, Silicone phantom, ICG*