

Focus on a recent molecular imaging workshop in India

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A one day pre-conference workshop on “molecular imaging in oncology” was held on November 21st, 2012 ahead of the International conference on radiation biology 2012 at Advanced Centre for Treatment Research and Education in Cancer (ACTREC), TMC, Navi Mumbai, India. The aim of the workshop was to illustrate various applications and the fundamentals of molecular imaging along with hands on demonstration of various imaging techniques from micro to macro.

In the first session of the workshop, applications of nuclear imaging were discussed in various types of cancer by Dr. V. Rangarajan, Tata Memorial Hospital, India. Scope of different nuclear medicine agents for imaging nephrons, sentinel nodes etc. were explained. For example ^{99m}TcECD can be used for imaging nephrons. It was further informed that such imaging applications help in diagnosis, staging and restaging of cancer and also help in classifying patients as high risk or low risk. Besides such imaging applications usefulness in understanding diseases like Alzheimer’s and epilepsy was described along with several examples from clinics. FDG-PET in diagnosis and staging of lung cancer, esophageal cancer, gall bladder cancer, cervix cancer and many others were discussed. In case of gall bladder cancer FDG-PET CT sensitivity is 100% for staging the disease. Points were raised on progress in detection and it was informed that previously 2 head gamma camera was used as detector where as at present solid state detector is used with which accuracy and sensitivity has increased for detection of abnormal tissue.

In the second talk by Dr. Sandip Basu, Bhaba Atomic Research Center, India, the potential of FDG to detect tumor biology was explained with examples of high FDG uptake in TNBCs (Triple negative breast cancer). Requirement of translating the potential of FDG for

detecting tumor biology together with various nuclear probes were discussed. The first session was concluded with a focus on preclinical radioactive imaging that was delivered by Dr. Abhijit De, ACTREC, India. Importance of probes in molecular imaging, their types and distribution were explained. Importance of cocktail method and how this method can be used to increase sensitivity and accuracy of molecular imaging techniques was described. The basic principles and application of Cerenkov imaging was described. The presentation highlighted CCD camera based Cerenkov luminescence detection which is broadening the scope of nuclear medicine applications in preclinical models.

The second session of the workshop was dedicated to understand the principles, techniques in *in vitro* and *in vivo* applications of bioluminescence, fluorescence, and multimodal imaging. In the first talk of the session, different types of microscopes were explained by Dr. Dibyendu Bhattacharyya, ACTREC, India. The principles and technical details of fluorescence resonance energy transfer (FRET) assays were discussed and their applications for understanding the basic mechanism were explained. The highlight was the introduction with data the new microscopic technologies where images captured from fluorescence and electron microscopy can be merged to provide better understating regarding the localization of any molecule. This was followed by a lecture by Dr. Pritha Ray’s. Dr. Ray from ACTREC, India, described the basics of “*in vivo*” bioluminescence and fluorescence imaging. Participants were also familiarized with some intrinsic problems in the fluorescence imaging, especially the auto fluorescence, and how the spectral unmixing (algorithm) improves the signal to background ratio and sensitivity.

Dr. Rao Papineni, CT, USA, gave the final talk of the

workshop with a focus on different molecular probes including the multimodal probes. The systematic process of probe development” that involves in the identification of a specific target, synthesis of probe, testing of the probe “*in vitro*” and “*in vivo*” was explained. The route in testing of these newly developed probes in small animals, later in non-human primates, and finally probe/biomarker testing in patients was discussed. The students and workshop participants appreciated how molecular imaging minimizes the time frame between target identification and clinical use of these biomarkers. Particularly, how optical and nuclear “*in vivo*” imaging applications play the critical role in the development of probes, and the assessment of the two important criteria -specificity and strength of probes. Use of nanotechnology in molecular imaging was introduced during the lecture with an example where nanoparticles are tethered with siRNA to target prostate cancer cells and tumor.

The talks were followed by lab demonstration of microscopy and preclinical PET, and fluorescence imaging techniques. Such educational programs/workshops will benefit students and young researchers from different disciplines of medical sciences to avail these advance technologies in their scientific careers. Countries like India have a huge scientific researcher workforce and in recent years made significant development in discovery and isolation of therapeutics compounds. Majority of these work characterized “*in vitro*” are in the pipeline for validation. Molecular imaging field, in fact is increasingly becoming important to take up the bullwork of systematic

validations “*in vivo*”.

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Footnote

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