

Molecular Imaging: Challenges and Opportunities in Medicine

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Molecular imaging encompasses a diverse group of novel techniques that provide spatial information from *ex vivo* studies of single molecules to *in vivo* studies of ensembles of molecules in man. The discipline uses energy across the EM spectrum to assess both endogenous chemicals and exogenous probes.

In medicine, imaging techniques (CT, MR and U/S) provided mostly anatomical information. Nuclear medicine and Positron Emission Tomography (PET) are the embodiment of molecular imaging. MR spectroscopy can provide chemical specificity and developments in MR imaging probes offer molecular specificity. While not a mainstay of medical imaging, optical imaging approaches offer certain advantages including chemical specificity. Data using diffuse optical tomography and “smart “ optical probes will be presented.

Major challenges in medicine include earlier detection of cancer, hemorrhage and differentiation of stable from vulnerable atherosclerotic plaques. Molecular imaging offers the opportunity to significantly enhance the care of patients with these conditions.