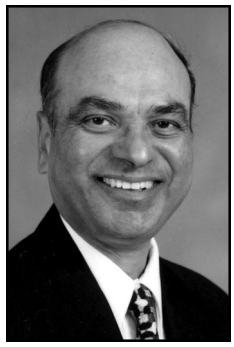
SNM to Establish Center of Molecular Imaging as New Field Emerges, Grows Rapidly

Following through on an integral part of its strategic plan, SNM's leadership appointed a task force to explore the possibility of forming a Center of Molecular Imaging. As a member of this task force, I believe that the center's goals should be to disseminate information on our understanding of biological processes of diseases at the molecular level and to promote the application of that information to diagnose diseases noninvasively at an early stage and to treat them effectively.

Molecular imaging (MI) is an emerging field that is growing rapidly. Recent technological innovations have enabled magnetic resonance, bioluminescence, optical fluorescence and ultrasound to make exciting contributions to the field of MI. At its March 2004 meeting in Chicago, IL, SNM's board of directors conceived a new Center of Molecular Imaging designed to keep its membership abreast of progress made on these technologies; this center clearly gives MI a home in SNM.

It is generally considered that radioactive tracer techniques, the hallmark of nuclear medicine, are more sensitive and less invasive than the other modalities in tracing molecular events that form the basis of diseases. Imaging cellular function, cell cycle progression, apoptosis, hypoxia, response to interventions, synaptic transmission, and degenerative neurochemical processes, using novel biomolecules labeled with suitable radioactive tracers will contribute greatly to the field of MI in general and to the field of nuclear medicine in particular. In just a handful of years, striking progress has been made in imaging instruments such as PET or SPECT that has enhanced our ability to detect minute abnormalities seated deep in the body. Radionuclides not used previously are being investigated for applications both in diagnosis and therapy. Many novel and specific molecular probes—such as peptides, peptide nucleic acids, cytokines, and their analogues—have drawn increasing attention for newer or improved applications, not only to target events in oncology, but also in cardiology, neurology, and endocrinology.



Mathew Thakur, PhD
SNM President

Investigators have considered for decades that genomic modulations at a cellular level are the genesis of most oncologic diseases. These genetic modulations lead to the expression of characteristic biomolecules, not only exogenously but also endogenously. Generally known as receptors and oncogenes, respectively, these fingerprints arise well ahead of the modulations in cell morphology that, today, form the primary basis for oncologic diagnosis. These fingerprints provide themselves as excellent targets for noninvasive and early determination of oncologic processes. The field of cell biology is rich in providing both such targets and specific probes that will complement MI.

The next decade should witness applications in individualized or customized imaging. Genomic chips will permit characterization of an individual's disease, and protein profiling will allow the use of radioactive probes that are specific to an individual's cancer or other fatal disorders. MI will then not only permit localizing the lesions but also enable physicians to determine the effectiveness of therapeutic interventions on their shape, size, function, and biochemistry.

The time for SNM to establish a center for MI could not have been more appropriate than now. The center, as guided by the expert members of a task force appointed by the SNM leadership, intends to focus on such topics as surrogate makers, drug development, tar-

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restaging disease in 40 patients with small cell cancer of the head and neck after induction chemotherapy followed by definitive chemoradiotherapy (CRT). They found that after induction chemotherapy, PET imaging had a sensitivity of 100% and specificity of 65% for detecting persistent disease at the primary tumor site. After both ICT and CRT were complete, the sensitivity and specificity of PET imaging were 67% and 53%, respectively, for detecting occult disease in cervical lymph nodes. The authors concluded that ^{18}F-FDG PET imaging showed some correlation with pathologic response after ICT and CRT in these patients and that additional investigation in this setting is needed.

Head and Neck

Early ^{18}F-FDG PET after Radical Radiotherapy in NSCLC

Hicks et al. from the Peter MacCallum Cancer Centre (Melbourne, Australia) reported in the October 1 issue of the *International Journal of Radiation Oncology, Biology, Physics* (2004;60:412–418) on the relationship and predictive significance of inflammatory changes detected by ^{18}F-FDG PET in irradiated normal tissues and metabolic response at tumor sites in patients after radical radiotherapy for non–small cell lung cancer (NSCLC). The study included 73 patients with NSCLC who underwent ^{18}F-FDG PET imaging at an average of 70 days after completion of radical radiotherapy. Radiation-induced inflammatory change and metabolic tumor response were assessed. Results indicated that increased ^{18}F-FDG uptake in normal tissues was associated with a greater likelihood of complete or partial tumor response as indicated on both PET and CT. The authors concluded that "postradiotherapy inflammatory changes detected by ^{18}F-FDG PET are positively correlated with tumor response, suggesting that tumor radioresponsiveness and normal tissue radiosensitivity may be linked" and that "prognostic stratification provided by PET is not compromised by inflammatory changes if a meticulous visual response assessment technique is used."

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geted diagnosis and therapies and—most importantly—on training. The task force will build a program, with input from MI experts from all disciplines, to promote research, education, and applications that will be beneficial to physicians, scientists, and technologists alike. Working in harmony with other research organizations in imaging, in academia, or industry will be an important goal.

Working with academic or industry-based organizations as well as federal agencies, the center will offer basic training courses and advanced research seminars at SNM gatherings. It will also serve as a forum to exchange knowledge, open dialogues, and advance the field of molecular imaging.

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