Our Responsibility

Molecular medicine defines the role of genomics and proteomics in personalizing health care delivery and improving outcomes for patients. Molecular imaging will be one of the major medical disciplines facilitating the introduction and clinical practice of molecular medicine. The integration of science, technology, and clinical practice in our current practice of nuclear medicine means that the discipline is uniquely placed to be the leader in the field of molecular imaging. This leadership will be shown in basic research, in translational research—taking research discoveries in cellular and molecular biology and other basic sciences into the clinical arena—and in clinical practice where the skills of our members will be invaluable in new paradigms in clinical care. However, there remain questions as to how this expanded role for nuclear medicine, molecular imaging, and molecular medicine will be defined and brought to routine practice.

SNM is defining the critical questions and initiating the appropriate strategies to identify and take advantage of the enormous potential of molecular imaging to enhance our understanding of disease genesis, processes, and treatment and to apply this new understanding to clinical practice. As *the* organization that has traditionally represented all professionals involved in the practice of nuclear medicine—and as the society within which molecular imaging originated—SNM is uniquely responsible for supporting the new field of molecular imaging, its scientists, clinicians and technologists, and the patients who will benefit from this new field.

Advancing Molecular Imaging and Therapy: As nuclear medicine is joined by—and integrates with—other modalities that are associated with molecular imaging, SNM has embraced an expanded core mission: "To improve health care by advancing molecular imaging and therapy." To implement this focus, SNM is emphasizing its new strategic direction in research, training, clinical practice, and advocacy of molecular imaging.

SNM has recently hosted an industry summit to discuss strategies for bringing the potential of molecular imaging to reality. This summit brought together innovative and forward-thinking researchers, commercial sector representatives, and officials from national government and regulatory agencies to explore "Shaping the Future" with molecular imaging. Over 3 days, nearly 70 senior-level participants interacted and discussed basic research, instrumentation, drug development, clinical issues, and educational and training needs. Participants addressed the possibilities of molecular imaging in enhancing research and clinical practice, and their findings will be presented in next month's Newsline. Some of these observations are included here.

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Basic Research: The power of molecular imaging to integrate information about location, structure, function, and biology will lead to a package of noninvasive, in vivo imaging tools that will have vast potential for improving translational research outcomes, patient care, and health care resource utilization. These tools include in vivo definition of the patient phenotype; characterization of tumor behavior and aggressiveness; techniques to predict, monitor, and quantify treatment response; and in vivo imaging biomarkers of disease. Interdisciplinary teams of imaging scientists, molecular biologists, clinicians, pathologists, bioinformaticists, and epidemiologists will work together to engage in collaborative research to profile tissue specimens and identify, characterize, and classify biomarkers to advance the field of molecular imaging and therapy. The development of information technology systems that fully integrate all the facets of a patient's history and clinical picture with information gained from molecular profiling will be required, and chemists, pharmacologists, and molecular biologists working together will expand the field of molecular imaging. These collaborations will integrate the research and understanding of disease processes needed to develop site-specific probes and reporter-probe systems. Traditional tracer-based nuclear medicine research will be expanded within the molecular imaging arena to include targeted contrast probes for quantitative MR imaging and MR spectroscopy, optical imaging, and quantitative radiotracer characterization of biological processes and drug interactions.

Instrumentation: An evolution in imaging technology is occurring and will continue as imaging capabilities continue to expand from the anatomical to the functional to the molecular to the genome. The expansion of imaging capabilities will allow the identification of imaging probes specific for molecular processes, and new multimodality imaging technologies will be developed to appropriately utilize these new probes, focusing on normal and abnormal biological processes. The future will bring nanoparticle

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could be attributed to weight differences. The authors concluded that the results of this study, indicating that similar normal tissue doses were calculated for 2 groups of patients with different cancers and genders, might be combined with continued careful analysis of the imaging data to "allow the use of higher starting doses in early-phase radioimmunotherapy studies."

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Health Physics

PET/CT Exposure of Technologists

Seierstad et al. from the Buskerud University College (Drammen, Norway) reported on September 20 ahead of print in *Radiation Protection and Dosimetry* on a study designed to map doses to technologist staff members after the installation of Norway's first dedicated PET/CT installation in 2005. The results of the study, which are consonant with those from other studies, calculated an average technologist dose of 20–25 nSv per injected MBq of ^{18}F. For an average injected activity of 350 MBq per patient, the International Committee on Radiologic Protection dose limit would be reached after imaging approximately 3,000 patients in a single year. For the authors' annual number of less than 500 patients and routine rotation of staff, an annual individual dose for the technologists was calculated at less than 2–3 mSv.

Radiation Protection and Dosimetry

IAEA Issues QA Guidance

In an article e-published ahead of print in the October/November issue of *Applied Radiation and Isotopes* (2006;64:1142–1146), Zimmerman et al. from the International Atomic Energy Agency (IAEA) reported briefly on a new guidance document issued by the agency for the implementation of quality assurance programs for nuclear medicine radioactivity measurement. The proposed programs are designed to enable laboratories, particularly those in developing countries, to provide consistent, safe, and effective radioactivity measurement services to the medical community. Details about the guidance should be available at www.iaea.org

Applied Radiation and Isotopes

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delivery vehicles to target new diagnostic approaches such as smart contrast agents, target-specific optical agents, and cell-based (stem cell) imaging and also to deliver gene therapy and other innovative interventions to patients. SNM recognizes the importance of ensuring that its members have the skills to be part of this diagnostic and therapeutic evolution.

Drug Development: The appropriate use of molecular imaging in drug discovery and development could significantly speed up the development process and save patients and the health care system millions of dollars. Molecular imaging techniques are already being used in receptor occupancy studies and with transgenic animal models to validate drug development. In all phases of clinical trials, molecular imaging probes will play an increasingly important role in developing new, smarter, and safer drugs for patients.

In Clinical Practice: Work will continue to examine and validate future clinical applications for FDG PET/CT for oncology, myocardial perfusion, neurology and neurosurgery, infection imaging, and other applications. The next generation of clinical radiotracer probes is already in early phase clinical development. The SNM Clinical Trials Group will ensure that these probes are appropriately validated and accepted by funders to enhance all aspects of patient care. Bioluminescence imaging, which enables visualization of genetic expression and physiological processes at the molecular level in living tissues, may identify, for example, metastatic potential and predict treatment effects.

Education and Training: We must see an evolution in the education of physicians to fully and effectively utilize changes in practice as molecular medicine and molecular imaging become part of routine clinical practice and as new probes and technologies are developed and translated into clinical practice. SNM is committed to ensuring that our members are uniquely placed to benefit from these health care advances.

As new research is performed and new modalities unfold, molecular imaging will continue to expand and grow, providing SNM the opportunity to contribute to improvements in patient care in a meaningful, positive, and cost-effective way.

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