



Cardiovascular Molecular Imaging

At this year's SNM Mid-Winter Meeting in San Antonio, TX, the Cardiovascular Council and Molecular Imaging Center of Excellence cosponsored a program entitled, "Advances in Cardiovascular Molecular Imaging." The program was organized by Mehran M. Sadeghi, MD, from Yale University, and included a series of lectures focused on the emerging field of molecular cardiovascular imaging. Novel approaches to target identification and development of new ligands for molecular imaging were reviewed. The panel of experts compared different imaging modalities for detection and evaluation of cardiovascular disease at the molecular and cellular levels.

The first presentation, "Proteomic and Genomic Approaches for Identifying Imaging Targets," was by Peter P. Liu, MD. He suggested that proteomics could potentially be utilized to: (1) yield novel biomarkers reflecting cardiovascular disease; (2) establish earlier detection strategies for cardiovascular disease; and (3) monitor responses to therapy. New approaches permit the large-scale identifica-

tion of peptide sequences in biological samples with mass spectrometry, whereas gel-based techniques provide further refinement on the status of posttranslational modification. The application of this high-throughput protein evaluation with a subset of predefined targets, identified through proteomics, microarray profiling, and pathway analysis, is gaining momentum in the preclinical and clinical evaluation of cardiovascular disease. Proteomic analysis has provided important insights into ischemic heart disease, heart failure, and atherosclerosis. The combination of proteomic biomarkers with clinical phenotypes and genetic haplotype information can lead to more precise diagnosis and therapy for individual patients, facilitating "personalized medicine."



Albert J. Sinusas, MD

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ABMS Requires Lifelong Learning

The 2001 decision by the American Board of Medical Specialties (ABMS) to replace recertification exams with maintenance of certification (MOC) programs went into effect this year. MOC programs are more comprehensive efforts to assess the ongoing competence of medical specialists and their ability to provide quality health care in 6 areas: medical knowledge, patient care, interpersonal and communication skills, professionalism, practice-based learning and improvements, and system-based practice.

In the past, the certification renewal processes required successful completion of an approved residency program, possession of an unrestricted medical license, and successful completion of the recertification examination. However, under the new ABMS requirements, physicians can no longer simply take an exam and show their license to renew a certificate. Instead, "lifelong learning" activities must be documented. The MOC program is designed to document the necessary competencies to provide quality patient care.

Participation is mandatory for diplomates with time-limited board certification. Although MOC programs are not mandatory for diplomates with lifetime certification, specialty boards are strongly encouraging *all* of their diplomates to participate in MOC for the following reasons:



Lynn Barnes, MEd

- **Enhanced expertise.** Medical knowledge is enhanced by keeping current with the latest research and advancements.
- **Patient benefit:** Patients are assured that they are receiving high-quality medical care.
- **Reimbursement:** It is anticipated that third-party payers will begin requiring all physicians to participate in a MOC program (pay-for-performance initiatives) in order to be eligible for reimbursement.

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Gregory M. Lanza, MD, PhD, gave the second presentation, "Synergy of Molecular Imaging and Targeted Therapy in Cardiovascular Disease." He discussed a variety of new nanotechnological techniques and tools for both diagnostic imaging and therapy, including current products and late-stage preclinical research. He focused on the use of integrin-targeted paramagnetic nanoparticles for MR imaging detection of angiogenesis in very early atherosclerotic disease. This novel MR agent provides quantification of the extent of disease and, at the same time, can convey therapeutic doses of an antiangiogenic drug, fumagillin, which slows plaque progression. After the targeted nanoparticle therapy, MR imaging, using the diagnostic version of the targeted paramagnetic nanoparticles, allows the longitudinal monitoring of therapeutic effects. Because the targeted nanoparticle drug delivery concentrates the drug at the desired site, the results are achieved with a total drug dose thousands of times lower than those in similar studies using conventional drug delivery schemes. Thus, targeted nanoparticles can improve the safety profile of the drug by lowering overall dosage and concentrating levels in disease sites. These nanotechnology applications appear to hold tremendous promise in medicine; however, the safety, function, and environmental effects of these new tools and techniques remain undefined.

The third presentation, "Novel Applications in Vascular Molecular Imaging," was provided by Sadeghi, who reviewed the potential of novel radiolabeled integrin- and matrix metalloproteinase-specific molecules for in vivo detection of vascular injury and remodeling. Targeted radiotracer imaging of atherosclerosis or vascular remodeling presents a unique problem, in that the target lesion has a very low mass and may be located deep in the body. This work was facilitated by the application of several novel experimental models and a hybrid microSPECT/microCT imaging system that allowed co-localization of radiotracer

uptake with in vivo arteriograms. He highlighted the importance of developing and applying targeted probes with both fluorescent and radioactive labels in these preclinical studies, as well as the use of fluorescent probes for cellular localization within the target tissues or organ.

The final presentation of this session, "Role of Targeted Molecular Imaging for Prediction of Post Myocardial Infarction (MI) Remodeling," was given by Albert J. Sinusas, MD. He presented preclinical studies demonstrating the potential of targeted imaging of integrins and matrix metalloproteinases for the prediction of post-MI remodeling. Targeted molecular imaging was used to directly relate critical regional molecular and cellular processes with the associated physiological consequences and changes in myocardial perfusion and mechanical function in both small and large animal models of ischemic injury. These preclinical experimental studies employed hybrid SPECT/CT imaging as well as MR imaging.

The future of targeted molecular imaging of the cardiovascular system rests on the development of targeted biologic markers and reporter gene techniques to evaluate gene therapy and of novel imaging instrumentation. Although targeted imaging of the molecular and physiological processes associated with cardiovascular disease will clearly play an important role in future advances, the translation of these imaging approaches to patients can be accomplished only through close collaboration among multidisciplinary teams with a wide range of expertise. Novel targeted imaging strategies complement standard imaging of physiological parameters, and such hybrid approaches are likely to play an important role in both diagnostic and prognostic purposes as well as for evaluation of therapeutic interventions.

Albert J. Sinusas, MD
Professor of Medicine and Diagnostic Radiology
Yale University
New Haven, CT

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- **Privileges and credentialing:** It is expected that most hospitals will require physicians to participate in an MOC program to maintain privileges.
- **Self-governance:** Instead of having the government dictate what constitutes high-quality medical care, the ABMS prefers that specialties define and disseminate their own standards through their respective MOC programs.

- **Malpractice premium reductions:** Research indicates that participation in a MOC program may result in reduced malpractice insurance premiums.

Self-assessment credit may be obtained by completing modules included on the SNM Lifelong Learning & Self Assessment Web site: www.snm.org/llsap.

Lynn Barnes, MEd
Director of Education, SNM