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the Senate unfortunately remained silent on the issue. In the version of the bill that ultimately became law, the House and Senate appropriated the money but committed it to specific, "earmarked" projects rather than to basic nuclear medicine research.

Although the loss was devastating for basic research projects formerly funded through the DOE OBER, the campaign to restore the program ultimately caught the administration's attention, and, as a result, the DOE, National Institutes of Health, and National Academy of Sciences will collaborate on a study of the future of U.S.-funded nuclear medicine research in 2006. In the meantime, SNM will continue to fight for basic research and will focus future efforts on finding a permanent home for these projects.

Coding and Reimbursement

Led by Gary Dillehay, MD, the SNM Coding and Reimbursement Working Group compiled and submitted comments to the Centers for Medicare & Medicaid Services (CMS) regarding the 2006 Healthcare Common Procedure Code System (HCPCS). Due in part to the committee's comments, the 2006 file contains significant changes suggested by SNM for many of the radiopharmaceuticals—specifically, 32 new, 24 revised, and 44 deleted radiopharmaceutical HCPCS Level II codes took effect January 1. At the request of the nuclear medicine community, the CMS HCPCS Workgroup implemented a simplified and user-friendly new standard format for radiopharmaceuticals, effective 2006. Also, all codes were changed to "A" series HCPCS codes, which will break down site-of-services variations for 2006. For the long haul, these radiopharmaceutical HCPCS Level II changes are significant accomplishments for the SNM.

The SNM Coding and Reimbursement Working Group also compiled and submitted comments regarding the 2006 Hospital Outpatient Prospective Payment System (HOPPS) rule and the 2006 Physician Fee Schedule rule to the CMS. The SNM was successful in many of their comments and suggestions, as evidenced in both final rules. The SNM plans to meet with CMS on some outstanding issues in 2006 regarding 2007 payments for many nuclear medicine procedures.

Nuclear Regulatory Commission

As part of an ongoing effort to improve relations with the Nuclear Regulatory Commission (NRC), SNM members Terence Beven, MD, Alan Packard, PhD, Gary Dillehay, MD, and Roy Brown participated in meetings regarding Section 651(e) of the Energy Policy Act of 2005, which granted the NRC regulatory authority over naturally occurring and accelerator-produced radioactive materials (NARM).

SNM took the position of supporting regulations that would guard the public from unnecessary exposure to radiation while simultaneously protecting medical/scientific accessibility to accelerator-produced materials for nuclear medicine procedures and research. However, SNM warned the NRC against duplicative regulatory burden that would stifle the benefits of PET and SPECT through delays, double fees, etc. SNM requested that NRC staff carefully weigh the public benefit gained from future NARM regulations against the potential costs and burdens to scientific progress, and, more important, patient care.

Food and Drug Administration

Led by Henry VanBrocklin, PhD, a working group compiled and submitted SNM comments regarding exploratory investigational new drug studies and PET drug Current Good Manufacturing Practices rule/guidance. The Food and Drug Administration (FDA) continues to work with nuclear medicine experts on a wide variety of topics, and collaboration between the FDA, medical societies, and industry continues to be beneficial for everyone involved, particularly patients in need of nuclear medicine procedures.

USP

Led by Joseph Hung, PhD, the SNM Committee on Pharmacopeia (COP) compiled and submitted comments regarding proposed revisions to U.S. Pharmacopeia (USP) <797>. The SNM COP continues to be a premier source of USP knowledge within the nuclear medicine community and is actively involved with relevant USP expert committees.

Hugh Cannon
SNM Director of Public Affairs, SNM

Physics Applications in Nuclear Medicine: Organization and Progress

The year 2005 was again a year of significant progress in the area of physics applications in nuclear medicine. Significant developments were seen in detector development and reconstruction technology, and new tools became available. The dosimetry community organized several important compendia of literature resources. Electronic resources continued to be developed and disseminated, as is the trend in almost all areas of daily professional life.

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Instrumentation and Analysis Innovations

The Annual Meeting of the SNM included papers chronicling promising technical developments in hardware and image reconstruction methods to improve the quality of clinical and research practice. The ability to identify depth of interaction achieved with Phoswich-type area detectors and multielement, multilevel block detectors with fast signal processing techniques promises improved PET and SPECT image resolution. A dual-ring system that uses both Compton coincidence and traditional 511-keV PET imaging was shown to produce spatial resolution better than 0.7 mm (*1*). A Medical Imaging Conference in the Institute of Electrical and Electronics Engineers Nuclear Sciences Symposium in October 2005 provided numerous examples of what is in the pipeline for clinical use. Improvements in scintillators and semiconductors for radiation detectors continue. Pixelated detectors can produce higher resolution than area detectors, and results obtained with silicon and with the higher stopping power of cadmium zinc telluride (CZT) are useful for direct imaging of the positron as well as PET applications in different embodiments (*2,3*). Silicon detector arrays are promising for low-energy SPECT imaging (*4*). The scintillator $LaBr_3$ is becoming available and being tested for use in gamma cameras sooner than had been predicted (*5*). Its high light output and fast decay time hold should lead to improved PET system performance, and the prospect of time-of-flight PET is being revisited (*6*). Improved arrays of avalanche photodiodes are now commercially available. Because they are unaffected by magnetic resonance fields, they hold real promise for concurrent small animal PET imaging in clinical MR imaging environments, and this could be as important as the addition of CT has been to PET and SPECT devices (*7,8*).

Dedicated breast-imaging systems for 3- and 4-dimensional PET, SPECT, and ultrasound imaging are in late stages of development, and initial clinical tests are anticipated in the coming year. Better geometry and increased spatial sampling are used and needed to achieve the high sensitivity and resolution needed for practical use in routine breast imaging. Multipinhole aperture systems pioneered by Barrett and the University of Arizona group for dynamic SPECT patient studies have moved a step closer to implementation on standard 2- and 3-headed clinical systems. The new systems are adapted primarily for small animal studies and provide the needed ultra-high resolution (0.2–0.5 mm). Clinical applications are expected based on systems developed and being tested by university research groups in Utrecht, The Netherlands (*9*), Philadelphia, PA, (*10*), and Jülich, Germany (*11*). Commercial companies are likely to market various systems and components in the coming year. One multipinhole aperture system is in the process of being marketed commercially for retrofitting clinical SPECT systems as high-resolution small animal imagers, based on technology from the Jülich group, and other companies are expected to market different models of collimator inserts.

Improved reconstruction algorithms continue to emerge. Cone beam reconstruction in the new generation of fast spiral multidetector CT systems has taken advantage of improvements in algorithms, and SPECT implementations have been reported (*12*) and reconstruction methods presented for use in nonuniform attenuating media (*13*).

A commercial camera was shown at the 2005 RSNA for nuclear cardiology applications which uses 10 CZT modules arrayed around a semicircle and was advertised to provide the same spatial resolution obtained with gamma cameras imaging ^{99m}Tc or ^{201}Tl in 1/10–1/20 the time currently used in clinical studies (*14*).

Much of the ongoing activity in universities, national laboratories, and industry is benefiting from close collaborations among groups with parallel goals. Great benefits are derived from these collaborations. A major problem that needs to be resolved relates to the availability of radioactive nuclides for use in the development and testing of new ideas and in the development of reliable, cost-effective means of disseminating them for widespread use. Most of the tracers available 20–30 years ago are no longer available. Even the best imaging device is not very effective without a strong signal from the targeting tracer that allows the production of a useful/meaningful image. The improved radiotracer availability problem has been recognized and addressed without success for at least 25 years, and we can only hope that this remaining roadblock can be removed.

Radiation Dosimetry and Radiobiology

The Journal of Nuclear Medicine (*JNM*) kicked off the year with a bang with the special supplement to the January issue entitled "Clinical Practice of Molecular Radiotherapy," organized by Steve Larson and Eric Krenning. In what was dubbed a "pragmatic perspective" by these editors, 25 superb articles on the practice of radionuclide therapy were penned by a "who's who" in this field (*15*). Overview articles and status reports on current technology in this area were given by contributors such as Kassis, Adelstein, deJong, Sgouros, Krenning, Pauwels, Sharkey, Goldenberg, Wahl, Zalutsky, and Buchsbaum, to name only a few. This supplement occupies a space on the bookshelf along with other authoritative references, separate from our normal collections of month-to-month journals. It is not possible in the space available here to spell out the important contributions from each of the 25 articles. Suffice it to say that this supplement is a landmark publication and necessary reading for anyone working in this field.

Similarly, Lassmann and Brans published the edited proceedings of the First International Symposium on Radionuclide Therapy and Radiopharmaceutical Dosimetry, held in Helsinki, Finland, in Sept 2004, in *Cancer Biotherapy and Radiopharmaceuticals* (*16*). Many important papers

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discussing image quantification, dosimetric techniques, radiation biology, microdosimetry, and other topics were covered by highly qualified and experienced researchers. As with other dosimetry conference proceedings from the historical series dating back to 1970, these volumes should be within easy access for all dosimetry professionals.

The loss of Hal Anger this year was deeply mourned by those who knew and admired him, as well as by the many others whose work was made possible by his many contributions to nuclear medicine instrumentation. He was a modest man who worked alone, with the support of University of California Lab staff when needed. Without his invention of the gamma camera and its many embodiments, nuclear medicine's emergence as a medical specialty would have been much delayed. The long history of fundamental contributions from the Donner Laboratory at the University of California derive from the contributions he made as an electronic genius left to work alone in a well-endowed institution.

We noted also with deep sadness this year the passing of 2 important long-time contributors to the fields of radiation biology and dosimetry, Katherine Lathrop, a pioneer in the study of radiotracer use and radiobiology (*17*), and Jim Robertson, who contributed heavily to the understanding of radiotracer use and who gave considerable support to radionuclide production during his work with the Department of Energy (DOE) for many years (*18*). Both were longtime active members of the Medical Internal Radiation Dose (MIRD) Committee.

Cuts in DOE funding for the Office of Biological and Environmental Research (BER) caused a swift reaction by SNM leadership and others to attempt to minimize reductions in funded programs that have been important to progress in basic physics research in nuclear medicine activities for many years (*19*). Current funding levels are significantly reduced from previous levels, and many historically good and productive research programs are feeling the pinch.

A few other items of interest:

- Mike Welch (*20*) updated his "Potential and Pitfalls of Therapy with α–Particles," with reference to articles by Pozzi and Zalutsky (*21*), among others.
- Similarly, Brechbiel (*22*) provided an update on the use of Auger emitters for targeted therapy, noting a new contribution in *JNM* in this area (*23*).
- Dosimetry for ^{201}Tl-chloride should hardly be considered "news," but a new publication in 2005 by Thomas and colleagues (*24*) reestablished standard dosimetry for this agent, with the focus on correcting an important overestimate in testes dose that had been influencing published dose estimates for this compound for more than 2 decades.
- Brix and colleagues (*25*) performed an interesting investigation into combined effective dose from CT and radiopharmaceutical exposures in PET/CT studies and suggested that attention be paid to optimization of patient exposures where possible. Radiation dosimetry in diagnostic medical studies is frequently not considered with the same seriousness as those in therapeutic studies, for obvious reasons. Nonetheless, attention to cumulative patient dose from repeated studies (and from different modalities) and attempts to optimize and reduce dose where possible are always wise.
- A nice summary of available radionuclides and radiopharmaceuticals was given by Ed Silberstein in the May issue of *JNM* (*26*).

Electronic Resources

The RAdiation Dose Assessment Resource (RADAR) Web site (www.doseinfo-radar.com) continued to receive heavy traffic for the free dissemination of standardized dose estimates, decay data, absorbed fractions, dose conversion factors, information on radiobiology and dosimetry literature, and other material. Published articles support the scientific basis for the data on this site (*27–29*). In 2004, the OLINDA/EXM software, the purported successor to the MIRDOSE 3 code, was released, and an article in *JNM* in 2005 established its technical basis (*30–32*). Vanderbilt University continues distribution of the code since receiving Food and Drug Administration approval through a 510(K) mechanism in 2004.

A number of interesting e-mail lists (NucMed, RadPharm, PET-mail, Medical Imaging [Archive-Comm-L], Radsafe, Dose-Net, and others) exist for exchanging information actively with other interested parties daily by e-mail. Subscriptions are free, and digest versions (once-per-day summaries of all posts) are usually available. A large number of Yahoo groups also exist that have application to this area of science (but which are too numerous to mention) and use a bulletin-board approach to exchange information. See http://hps.org/resources.html for more details.

Michael Stabin, PhD
A. B. Brill, MD, PhD
Vanderbilt University
Nashville, TN

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The SNM Strategic Plan for Education

The SNM Committee on Education held a meeting on September 16, 2005, to review the society's educational program to ensure that it meets our strategic goals and the needs of SNM members and other health care professionals with an interest in nuclear medicine and molecular imaging. The committee considered 4 significant issues facing medical education:

1. Maintenance of certification (MOC);
2. Emerging technologies in nuclear medicine/molecular imaging;
3. The need for more online education; and
4. The fragmentation of nuclear medicine and molecular imaging.

These 4 issues will have a significant and long-term impact on the way health care professionals in nuclear medicine/molecular imaging choose to educate themselves and on how providers of education develop and implement educational activities.

The American Board of Medical Specialties (ABMS) MOC process is a major focus of the educational activities of the SNM. At the Mid-Winter Meeting in January 2004, the Board of Directors approved the business plan for