

American College of Nuclear Physicians and the Molecular Imaging Center of Excellence.

Finally, the CVC has been working in collaboration with SNM governing committees to develop credentialing criteria for cardiac PET, cardiac CT, and cardiac hybrid imaging procedures. Work is underway to develop practice guidelines for various procedures and clinical scenarios. The CVC recognizes the need to consult and in some cases work with other organizations that have been at the forefront of the development of credentialing, procedure, and practice guide-

lines, such as the American Society of Nuclear Cardiology, the Society of Cardiovascular Computed Tomography, the American College of Cardiology, and the American Heart Association. It is best when those practicing nuclear cardiology advocate with a unified voice as we explain the great benefits of the work we do, especially the benefits to our patients, whose well-being is our ultimate goal.

*Mark I. Travin, MD
President, SNM Cardiovascular Council*

From the SNM MIRD Committee

The Medical Internal Radiation Dose (MIRD) Committee of the SNM continues to pursue its mission to develop standard methods, models, and mathematical schema for assessing internal radiation dose from administered radiopharmaceuticals. To accomplish its goals of providing basic tools, methods, and guidance for effective application of dosimetry techniques in clinical practice, the MIRD Committee builds on recent advances in molecular medicine, radiopharmaceutical design, and imaging instrumentation. Some of the key projects addressed by the committee in 2006 include: (1) providing a software tool on the SNM Web site that implements MIRD model calculations; (2) compiling comprehensive radionuclide data and decay schemes for use by investigators in diagnostic and molecular therapeutics (for distribution in 2007); (3) generating electron and photon absorbed fractions for updated and more realistic anatomical phantoms; (4) assessing the dosimetric implications of alpha-particle emitters as molecular therapeutic agents; and (5) developing a formalism for incorporating radiobiologic effects into dosimetry models to enable a better understanding of the correlation between absorbed dose and biological response. In addition, the committee has been active in educational areas, including serving as co-organizer of the International Symposia on Radionuclide Therapy and Radiopharmaceutical Dosimetry and sponsoring continuing education courses on emerging topics of interest in dosimetry at the SNM Annual Meetings.

A Dynamic Bladder Software Tool was installed and made available for download from the MIRD page of the SNM Web site (<http://interactive.snm.org/index.cfm?PageID=4309>). This interactive, Windows-based program, configured by Michael Stabin, PhD, implements the dynamic urinary bladder model described in MIRD Pamphlet No. 14 Revised (1). Users may select from kinetic models for 20 standard pharmaceuticals or enter their own kinetic data to obtain graphs and tables of bladder wall surface doses. The purpose of the software is to automate the use of this complex model, provide the results in electronic form, and allow convenient extension of the model to radiopharmaceuticals

not considered in the pamphlet. The software was designed as an educational and research tool providing investigators with the capability to compare the effects of varying protocols on bladder wall dose.

One of the major publication projects nearing completion is a revised edition of the MIRD Radionuclide Data and Decay Schemes monograph originally published in 1989 (2). This revision will provide tabulated energies and intensities of radiations emitted in the decay of 331 radionuclides of relevance in diagnostic and therapeutic molecular medicine. The work was carried out in collaboration between Oak Ridge National Laboratory (ORNL; Keith F. Eckerman, PhD) and the Japan Atomic Energy Research Institute (Akira Endo). The new edition includes 89 radionuclides that were not addressed in the earlier edition, reflecting additional radionuclides that are either currently in use or offer promise for future use in molecular medicine. An accompanying CD will enable access to detailed emission data (beta spectra, tabulated decay data, decay schemes) in electronic format. The MIRD Committee looks forward to distribution of this monograph in 2007.

Task groups within the MIRD Committee are engaged in preparing a number of publications that are expected to be available in 2007. A monograph on "Absorbed Fractions for Photon and Electron Sources" will provide a revised series of phantoms (adult, pediatric, and pregnant women computational models) incorporating modifications to the existing ORNL series. Monte Carlo transport simulations have been carried out for both photons and electrons from which tables of absorbed fractions and specific absorbed fractions have been generated. This effort has been lead by Wesley Bolch, PhD, and his group at the University of Florida.

Interest is increasing in the potential of alpha-particle emitting radionuclides in the treatment of cancer. Advances in the targeted delivery of radionuclides, in radionuclide conjugation chemistry, and the increased availability of



Stephen R. Thomas, PhD

alpha-emitters appropriate for clinical use have led to recent patient trials of alpha-emitter labeled antibodies. Addressing this emerging field, a task group under the leadership of George Sgouros, PhD, has developed a MIRD report on "Dosimetry and Human Use of Alpha-Particle Emitters for Targeted Radionuclide Therapy." The objectives are to review those aspects of the field that are pertinent to targeted alpha-particle emitter therapy and to provide guidance and recommendations for human alpha-particle emitter dosimetry.

An important area of investigation involves correlation of radiation dose in normal tissues with predicted and reported organ response. Generating models and tools to assess this correlation for both uniform and nonuniform distributions of radioactivity in organs represents a critical ongoing endeavor. A task group chaired by Barry Wessels, PhD, is preparing a MIRD pamphlet on "The Effect of Model Assumptions on Kidney Dosimetry: Implications for Radionuclide Therapy." With the advent of aggressive therapeutic strategies for cancer treatment using targeted radionuclide therapy, reports have appeared in the literature documenting significant renal impairment or failure. Use of available data in conjunction with the MIRD multiregion kidney model (3) opens the possibility of applying radiobiological analyses (e.g., dose rate, repair time of sublethal damage, and differential suborgan radiosensitivity) so as to better understand and predict renal toxicity.

In brief, other documents under preparation and in line as potential MIRD publications include: "Radiation Absorbed Dose Estimates for ⁹⁰Y-Ibritumomab Tiuxetan (Zevalin™)," "MIRD Commentary: Patient-Specific Dosimetry in Radionuclide Therapy," "The Case for a Treatment Planning Approach to Radioiodine Treatment of Thyroid Cancer," "Standard Techniques for Acquiring Preclinical and Clinical Data for Radiopharmaceutical Data," and "Revisions/Expansions of the MIRD Schema."

The MIRD Committee has been in active collaboration with the European Association of Nuclear Medicine (EANM) Task Group on Dosimetry (chair, Michael Lassmann, PhD, Würzburg, Germany) in coordinating the International Symposia on Radionuclide Therapy and Radiopharmaceutical Dosimetry. The 1st International Symposium took place in conjunction with the Annual Congress of the EANM in September 2004 in Helsinki, Finland. In October 2006, the 2nd International Symposia was held in Athens, Greece, and constituted a separate track within the EANM Congress. The scientific program was highly interactive, as it brought together scientists and clinicians working in the fields of radionuclide therapy, applied dosimetry, radiopharmacy, and radiobiology. By establishing a compact, dedicated environment, the symposia served in an optimal way to promote discussion and the exchange of information and also established a platform for future interactions. The MIRD Committee is evaluating the possibility of holding the 3rd International Symposium in conjunction with the 2009 Annual Meeting of the SNM in Toronto, Canada.

On an annual basis, the MIRD Committee sponsors continuing education courses at the SNM annual meeting. In 2006, 2 sessions organized by Sgouros were provided on the topic of "Bystander and Low-Dose Rate Effects—Are These Relevant to Radionuclide Therapy?" Part I focused on the fundamental radiobiology, and Part II highlighted the implications of these effects on preclinical and clinical radionuclide therapy studies. A continuing education article summarizing these sessions has been prepared for publication in *The Journal of Nuclear Medicine*. The program for 2007 will address "Basic Internal Dosimetry Methods in Nuclear Medicine" and will include topics on image quantification for dosimetry, patient-specific dose calculations for therapy, clinical use of radiation dosimetry, and participation by the U.S. Food and Drug Administration regarding aspects of dosimetry requirements in clinical trials.

As a final note, the MIRD Committee presents the Loevinger–Berman Award annually in recognition of excellence pertaining to the field of internal dosimetry as it relates to nuclear medicine through: (1) research and/or development; (2) significant publication contributions; or (3) advancement of the understanding of internal dosimetry in relationship to risk and therapeutic efficacy. The 2006 Loevinger–Berman Award was presented by Wessels at the annual meeting in San Diego, CA, to Gordon L. Brownell, PhD. Brownell was honored for his career spanning 6 decades and characterized by excellence in the engineering sciences and medical technology and for his outstanding original contributions to internal dosimetry and the development of positron imaging and PET.

The MIRD Committee looks forward to serving the SNM regarding issues involving dosimetry of internal emitters, particularly as our society initiates strategies for advancing molecular imaging and molecular therapeutics as a more effective means to manage disease and improve the quality of life for patients.

Members of the MIRD Committee include: Stephen R. Thomas, PhD, chair; George Sgouros, PhD, vice-chair; Wesley E. Bolch, PhD, secretary; Alexander J. McEwan, MD, board liaison; Aaron B. Brill, MD, PhD; Darrell R. Fisher, PhD; Roger W. Howell, PhD; John L. Humm, PhD; Ruby Meredith, MD, PhD; Michael G. Stabin, PhD; Barry W. Wessels, PhD.

REFERENCES

1. Thomas SR, Stabin MG, Chen C-T, Samarantunga RC. MIRD Pamphlet No. 14 Revised: A dynamic urinary bladder model for radiation dose calculations. *J Nucl Med*. 1999;40:102S–123S.
2. Weber DA, Eckerman KF, Dillman LT, Ryman JC. *MIRD: Radionuclide Data and Decay Schemes*. New York, NY: Society of Nuclear Medicine; 1989.
3. Bouchet LG, Bolch WE, Blanco HP, et al. MIRD pamphlet no. 19: absorbed fractions and radionuclide S values for 6 age-dependent multiregion models of the kidney. *J Nucl Med*. 2003;44:1113–1147.

*Stephen R. Thomas, PhD
Chair, SNM MIRD Committee*