

concise. I cannot be satisfied without seeing the primary radiation and the half-lives. The report suggests the use of *MIRD Pamphlet 5* without referring to *MIRD Pamphlet 5 Revised*, the more current reference. This omission suggests that this work required some time to prepare and should have been updated before publication.

I am especially enthusiastic about the six examples in Appendix C. These are particularly instructive to the dosimetrist faced with a similar problem. This volume should be added to the collection of those making dose calculations.

BARBARA Y. CROFT
University of Virginia
Charlottesville, Virginia

PREPARATION AND CONTROL OF RADIOPHARMACEUTICALS IN HOSPITALS. K. Kristensen. Vienna, International Atomic Energy Agency, 1979, 119 pp, Austrian Schillings 185

This manual is a complete set of guidelines for radiopharmacy design and operation prepared at the request of the International Atomic Energy Agency and is published in the IAEA's Technical Reports Series in cooperation with the World Health Organization. The guidebook neither covers industrial production nor provides recipes for radiopharmaceuticals. Rather, it is a concise, comprehensive description of the principles for formulation and quality assurance, suitable for hospitals and regional radiopharmacies. Guidelines are addressed at three levels of practice and scope of operation.

The essentials of the guidelines are in the chapter in which Good Radiopharmacy Practice (GRP) is defined and rationalized. The concept of GRP, as developed by Kristensen over the past decade, is a synthesis of current radiopharmaceutical technology, standards from national and international pharmacopoeias, and accepted standards for radiological health. The important elements of GRP include organization and training of personnel, facility design and equipment, documentation of tasks, written working procedures, and suitably written quality control activities; of these, personnel management is a principal component. The goal of quality assurance is to build in quality because the short-lived nature of these drugs precludes extensive end-product evaluation.

An excellent discussion of environmental control presents realistic approaches to reducing microbial contamination and minimizing radioactive contamination. Laminar air-flow (LAF) units, essential for manipulation of sterile products, are discussed explicitly. A mini-LAF unit, suitable for operation within a fume hood, offers a compromise in cases where requirements for microbiological and radiological controls are at odds. Specific information on dosage forms is limited to manipulation of Tc-99m and In-113m generators, formulation of radiopharmaceuticals bearing these labels, and the handling of ready-to-use radiopharmaceuticals. A set of useful appendices, a glossary, and a carefully selected bibliography complete the manual.

The interesting and straightforward style of the author and inclusion of ample illustrations contribute to the interest of a difficult subject. This manual is particularly useful to hospitals that are setting up a nuclear pharmacy. Moreover, it is an excellent teaching tool for instructing personnel in basic radiopharmaceutical techniques.

JAMES F. COOPER
Medical University of South Carolina
Charleston, South Carolina

TRITIUM AND OTHER RADIONUCLIDE LABELED ORGANIC COMPOUNDS INCORPORATED IN GENETIC MATERIAL: NCRP REPORT NO. 63. NATIONAL COUNCIL ON RADIATION PRO-

TECTION AND MEASUREMENTS. Washington, DC, IAEA, 1979, 116 pp, Austrian Schillings 185

This tightly packed, little paperbound book has as its subject the radiation dose to cells from incorporated radioactive material. According to the authors, NCRP Scientific Committee 24, the most sensitive cellular material is the genetic material of DNA and RNA in the nucleus. The biological effects of exposure are examined, since each cell line has its own sensitivities and hazards, which must be taken into account when a particular radioactive material is considered. The various kinds of radiation injury may lead to cell death, failure to mature, tumor genesis, transmutation of nuclides leading to DNA breaks, and gene mutation. Some of these injuries are no more potent when the source is external, whereas others, such as transmutation, occur only inside cells.

The method for dose calculation is based upon the concern for doses coming from heterogeneously distributed beta emitters. The critical volume is the nucleus of stem cells, since injury to stem cells leads to late somatic and genetic effects. The dose at issue is that to labeled stem cells, not the whole population of stem cells. On this basis a maximum permissible intake of the material in question is calculated. The reference cell nucleus is a sphere 8 μm in diameter with a volume of $270 \times 10^{-12} \text{ cm}^3$ or $270 \times 10^{-12} \text{ g}$. The average absorbed dose per decay in the reference nucleus is given for several nuclides in chart form.

Each nuclide, H-3, C-14, P-32, S-35, I-131, and I-125, is studied in turn for the peculiarities of its compounds and decay patterns. The NCRP Committee has deftly taken advantage of many sources of information to pull together evidence for the effects of these materials. Each reader will probably fasten on several facts that seem to stand out. Particularly striking was that, except for the special case of I-125, energy deposition from beta radiation in nucleic acids outweighs the effect of transmutation. Iodine-125 is a special case either because of the high ionization density of the Auger electrons or of the charge transfer to the DNA molecule caused by the Auger process. This latter explanation seems favored because of the efficiency of I-125 for producing double-strand breaks in DNA. The I-125 would be incorporated into DNA in 5-iodo-2'-deoxyuridine, which substitutes for thymidine.

The seven appendices treat topics of special interest. Tritium is emphasized because of its prominence as an atmospheric contaminant from weapons testing and nuclear power plant operation. The conclusion that environmental tritium is unlikely ever to produce detectable, deleterious effects is comforting.

Appendix V reviews for the reader the metabolism of DNA, RNA, and their precursors in a very lucid way. This appendix should perhaps be read first to gain a vocabulary and vantage point. The next appendix, "Stem Cells, Somatic Mutation and Carcinogenesis," is important as well, and the last appendix reviews all the evidence for genetic mutation for the radioactive materials in question.

The substance of this volume is contained in Appendices V, VI, and VII, which comprise 40% of the text. This part of the book is enlightening reading for those interested in radiation effects at the cellular level but who are not dosimetrists or not practically concerned with maximum permissible body burdens. The book is thus recommended for an audience of scientists other than the dosimetrists.

BARBARA Y. CROFT
University of Virginia
Charlottesville,
Virginia

MEDICAL APPLICATIONS OF X-RAY FLUORESCENT EXCITATION ANALYSIS. Leon Kaufman, David C. Price, Eds. Boca Raton, CRC Press, 166 pp, \$49.95

The editors' stated purpose in producing this volume is "to acquaint the interested physician or physicist with the basic principles

and the instrumentation relevant to fluorescent excitation analysis (FEA), as well as some present and future biomedical problems." The first section, consisting of three chapters, is devoted to basic principles of FEA. In this section, the authors present a working background of atomic physics concepts—knowledge necessary for comprehending the applications of FEA that follow in later chapters. Also presented in this section are descriptions of the semiconductor technology and signal processing electronics necessary for adequate resolution of XRF spectra along with descriptions of the various excitation methods currently available. This section appears to have been written primarily for physicists and is well illustrated with appropriate tables and graphs.

Section II, comprising a single chapter, presents a brief description of trace elements in man and their relation to certain diseases. An interesting study involving trace element analysis of serum in two families carrying the disease, Menke's Kinky Hair Syndrome, is presented as an example of the applicability of FEA to trace element analysis.

Section III, three chapters, is devoted to in vitro and in vivo applications involving stable tracer analysis. Techniques for FEA analysis of stable tracers are presented based on experience at the UCSF Radiologic Imaging Laboratory. Specific applications of

in vitro measurement of extracellular fluid space, red cell volume, plasma volume, red cell survival, glomerular filtration rate, in vivo measurements of cardiac output, cerebral blood flow and blood volume, and clearance of heavy metal powders from the lungs are described. Also included is a description of kinetic studies involving radiologic contrast agents using FEA.

Fluorescent scanning of the thyroid is discussed in the last section, with a chapter describing current instrumentation and a chapter devoted to the clinical utility of the technique. It is fitting that this volume concludes with thyroid scanning, since it was this application that introduced FEA into the nuclear medicine field.

Physicians should find this text useful in reviewing the state-of-the-art in fluorescent excitation analysis applications to biological problems. For physicists, it should prove to be an excellent reference for implementation of FEA techniques.

JAMES A. PATTON
Vanderbilt University Medical Center
Nashville, Tennessee

BOOKS RECEIVED

Handling Radioactivity. A Practical Approach for Scientists and Engineers. Donald C. Stewart. New York, Chichester, Brisbane, Toronto, John Wiley & Sons, 1981, 282 pp, illustrated, \$35.00

Computed Tomography and Cerebral Infarctions. With an introduction to practice and principles of CT scan reading. J. Valk. New York, Raven Press, 1981, 190 pp, illustrated, \$29.50

Nuclear Medicine Technology and Techniques. Donald R. Bernier, James K. Langan, L. David Wells, St. Louis, C.V. Mosby Company, 1981, 538 pp, illustrated, \$34.50

Clinical and Experimental Applications of Krypton 81m. J. Peter Lavender, Ed. British Journal of Radiology. Special Report No. 15. 1978, 193 pp, illustrated

Frontiers in Nuclear Medicine. W. Horst, H. N. Wagner, Jr, J. Buchanan, Eds. Berlin, Heidelberg, New York, Springer-Verlag, 1980, 336 pp, illustrated, \$54.90

Patient Care in Radiology. Ruth Ann Ehrlich, Ellen McCloskey Givens, St. Louis, The C.V. Mosby Company, 1981, 191 pp, illustrated, \$12.95

Early Detection of Testicular Cancer. Niels E. Skakkebaek, Jorgen G. Berthelsen, Kenneth M. Grigor, Jakob Visfeldt, Eds. (Proceedings of a workshop held in Copenhagen, Denmark on November 5-7, 1980). Scriptor, Copenhagen, 1981, 240 pp, illustrated, \$20.00 (including postage)

Thermoluminescence Dosimetry. Medical Physics Handbook 5. Adam Hilger Ltd. (Heyden & Son Inc.) A. F. McKinley, 1981, 170 pp, illustrated, \$28.00

Fundamentals of Radiation Dosimetry. Medical Physics Handbook 6. Adam Hilger Ltd. (Heyden & Son Inc.) J. R. Greening, 1981, 160 pp, illustrated, \$27.00