BOOK REVIEWS

RADIOPHARMACEUTICALS STRUCTURE-ACTIVITY RELATIONSHIPS. R. P. Spencer, Ed. New York, Grune & Stratton, 1981, 843 pp, illustrated, $45.00

Structure-activity relationships have proven to be invaluable tools both for improving the effectiveness of pharmaceuticals and in understanding their mode of action. The same tools are being applied, for the same reasons, to the design of radiopharmaceuticals. This book comprises the proceedings of a recent meeting on structure-activity relationships applied to radiopharmaceuticals.

With conventional structure-activity studies, compounds of known and well-defined structures are used, but the activity is frequently difficult to measure. However, in radiopharmaceuticals the activity, as defined by specific organ uptake, is easy to measure but the exact structures of the administered compounds are frequently unknown and may not be known if there is more than one compound present in the administered solution. This observation is reflected in the different contributions to the book where the "organic" compounds, i.e., those compounds containing nonmetallic radionuclides and thus of well-defined structure, fit most satisfactorily into the classic structure-activity relationships. Thus, the chapter on receptor-binding estrogenic compounds is an elegant description both of the binding characteristics necessary in a compound to measure receptor concentration and of the structural requirements of the compound to meet these characteristics. Other chapters concerning organic compounds follow this theme and contain much valuable data and important theoretical considerations.

As soon as metals become involved, however, the pathway between the data and the explanations becomes obscured by the intervening uncertainties of structure, "in vivo" ion transfer, charge, and solvation. The myocardial cation transport system consistently discriminates between sodium and potassium cations, but the potassium side of the system can incorporate other cations as dissimilar as quaternary ammonium salts and monovalent thallium. When the quantitative dynamics are studied, the mystery deepens as each cation follows its own path with little regard for either its closest or distant neighbors.

With the technetium-HIDA derivatives, the hepatobiliary excretion follows consistent pathways as the lipophilicity and metal-binding characteristics of the ligand are changed. Yet there is still the "magic" methylene, unnecessary for coordination, uninvolved in solubility, with no effect on the presumed gross structure or charge of the complex, but it cannot be touched without completely changing the "in vivo" characteristics of the compound.

The application of structure-activity relationships to radiopharmaceuticals is a subject in its infancy, and this book reflects that fact. Where the classical tools are applicable, they are applied with skill and precision. Where the established methods fail, there are false starts and perilously balanced logic. The correct paths will be found and this book represents the beginning of the search.

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RADIATION PROTECTION: A GUIDE FOR SCIENTISTS AND PHYSICIANS. 2nd Ed. J. Shapiro. Cambridge, Harvard University Press, 1981, 480 pp, $25.00

Radiation Protection is a welcome addition to the library of concerned scientists who deal with radiation in their professional life and are therefore continuously approached as a resource person when questions of radiation safety arise in our increasingly radiation-conscious society. This second edition is an extensive revision of the first, including an explanation of SI units (without actually making the transition in the text), a reworking of the internal dosimetry sections based on the MIRD documents, and additional material on radiation detectors, regulations, and topics of public interest regarding nuclear power and weapons.

This book is easy to understand for the broad spectrum of scientists and in large part by the concerned and knowledgable lay public. The professional radiation scientist can obtain most of the technical information presented in this book from other more detailed sources, but the intended audience of intentional or unwitting radiation users will find here an enormous span of useful information, well written and concise, to suit their laboratory and humanistic needs. I include in this population the biochemist who routinely manipulates radioactive isotopes in the laboratory, the physician who must be made aware of the serious consequences of our present day radiographic inflation, the reporter faced with a cloud of confusion at every radiation-related story, politicians who must eventually deal with the real costs of nuclear weapons production, and the energy consumer whose confusion is understandable given the confusion evidenced by the experts. For these very important readers Part VI, "Ionizing Radiation and Public Health," provides easily accessible details on protection standards, sources and risks of population exposure, fallout, nuclear power, radiation accidents from Gabon to Three Mile Island, and the gruesome effects of nuclear war. These final one hundred pages can be read without reference to the rest of the book. They provide very interesting reading for lay persons and well-documented fodder for public lectures or cocktail talk on radiation and public health.

The book opens, Stanley Kubrick style, with the origins of terrestrial radiations at time zero, when the temperature of the universe was some 10^{33} degrees and matter had not yet condensed, a delightful introduction to the radiation environment we find ourselves in now. After a very brief description of the composition of atoms, the reader is introduced directly to the characteristics of charged particles and photons, beginning with a brief discussion of radiation injury and containing most of the standard, albeit nonmathematical, details of directly and indirectly ionizing radiations. The material is very tightly controlled, containing little that is extraneous to the needs of the radiation user and yet reasonably complete and clear in its coverage of a wide range of basic radiation science.

Perhaps because of the large scope of this book and the lack of mathematics there are errors of omission. Absorbed dose is never really defined, though mean absorbed dose is discussed. A nicely detailed figure illustrating various ionization patterns produced by common radiations would lead easily into some mention of specific energy and the limitations of the concept of absorbed dose, but does not. This then leads to errors such as the statement that "The higher the LET, the greater the injury produced for a given