Radiochemistry

PROFESSOR
IGOR N. BECKMAN

RADIATION AND NUCLEAR MEDICINE:
physical and chemical aspects

7

I.N.Beckman

Radiation and nuclear medicine: physical and chemical aspects

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Abstract

"Radiation and nuclear medicine: physical and chemical aspects" is the 7th volume in popular *"Radiochemistry"* text-book series, authored by prof. I. Beckman. This volume is dedicated to clinical applications of ionizing radiation and radionuclides. The author describes their usage in modern diagnostics, surgery and therapy and provides numerous practical examples to the reader. **Part I** describes the phenomenon of radioactivity, nuclear reactions, interactions of ionizing radiation with matter and biological effects of radiation. Current national and international radiation safety guidelines and sanitary standards are provided. **Part II** of the text-book is dedicated to methods of radiation diagnostics (planar X-ray imaging and CT scans) and therapy (X-ray-, γ-, and hadron therapy; radiosurgery, brachytherapy). **Part III** contains essential information on radionuclide diagnostics and therapy. The author describes the theoretical foundations, equipment and applications of scintigraphy, radioimmunoassays, single-photon emission computed tomography, positron emission tomography and kinetic methods. Methods and equipment for production of short-lived radioisotopes, as well as synthesis of radiopharmaceuticals are all outlined in the concluding chapters of present volume. The author reviews techniques which are currently employed in radiation and nuclear medicine as well as their applications in diagnostics and therapy of malignant tumors.

The volume has been written as an accompanying text-book for post-graduate students, taking advanced courses in chemistry and physics. However, it can be used a reference book by researchers working with radiation and by everyone who is interested in ionizing radiation, radioisotopes and their medical applications.

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Physical principles of nuclear medicine. Radiation safety in nuclear medicine. Instrumentation in nuclear medicine. Imaging methods.Â 34-1). The third factor that distinguishes PET is the chemical and biologic form of the radiopharmaceutical. The radiotracer is specifically chosen for its similarity to naturally occurring biochemical constituents of the human body.Â Beginning in 2000, major nuclear medicine camera manufacturers developed combined PET and CT systems that can simultaneously acquire PET functional images and CT anatomic images. Both modalities are coregistered or exactly matched in size and position. The success of these camera systems led to the development of combined SPECT and CT systems as well. 8.3. Radiation safety aspects of radiopharmaceutical. preparation . . . 8.4. Safety precautions: Ward and other non-nuclear.Â Nuclear medicine physicians must be able to interpret the wishes of their clinical colleagues and demonstrate how clinical practice can be improved by the use of nuclear medicine techniques. It is, of course, imperative to achieve a certain standard of clinical practice before it can benefit from nuclear medicine.Â Other benefits of nuclear medicine include safety, non-invasiveness and cost effectiveness. In the future, there will be increased emphasis on distance learning and on â€˜hub and spokeâ€™ type systems, so that local data acquisition can be transferred to a centre for data analysis and for second, or specialist, reporting.