Medical Radioisotopes Production Without A Nuclear Reactor

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Homogeneous Aqueous Solution Nuclear Reactors for the Production of Mo-99 and Other Short Lived Radioisotopes
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Advancing Nuclear Medicine Through Innovation

Cyclotron Based Production of Technetium-99m
Analysis of Cancer Risks in Populations Near Nuclear Facilities

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An Introduction to the Physics of Nuclear Medicine Morgan & Claypool Publishers
This publication presents a summary of discussions from a consultants meeting on the merits and challenges associated with the operation of aqueous homogenous reactors (AHRs) for the production of the isotope technetium-99m (99mTc) and includes the technical presentations given by the participants during the meeting. Currently, 80 per cent of all radiopharmaceutical procedures employ 99mTc, a product of the decay of the isotope 99Mo. It is normally obtained through the fission of highly enriched uranium (HEU), but research has shown that the use of AHRs offers an attractive alternative to the conventional target irradiation method of producing 99Mo. The elimination of the need for targets allows the reactor to run at much lower power and therefore holds interest for companies developing innovative solutions to satisfy increasing demands for medical isotopes.
Handbook of Radiopharmaceuticals National Academies Press
This publication provides the basis for the education of medical physicists initiating their university studies in the field of nuclear medicine. The handbook includes 20 chapters and covers topics relevant to nuclear medicine physics, including basic physics for nuclear medicine, radionuclide production, imaging and non-imaging detectors, quantitative nuclear medicine, internal dosimetry in clinical practice and radionuclide therapy. It provides, in the form of a syllabus, a comprehensive overview of the basic medical physics knowledge required for the practice of medical physics in modern nuclear medicine.
Medical Isotopes Production Project Molybdenum-99 and Related Isotopes University of Chicago Press
The decay product of the medical isotope molybdenum-99 (Mo-99), technetium-99m (Tc-99m), and associated medical isotopes iodine-131 (I-131) and xenon-133 (Xe-133) are used worldwide for medical diagnostic imaging or therapy. The United States consumes about half of the world's supply of Mo-99, but there has been no domestic (i.e., U.S.-based) production of this isotope since the late 1980s. The United States imports Mo-99 for domestic use from Australia, Canada, Europe, and South Africa. Mo-99 and Tc-99m cannot be stockpiled for use because of their short half-lives. Consequently, they must be routinely produced and delivered to medical imaging centers. Almost all Mo-99 for medical use is produced by irradiating highly enriched uranium (HEU) targets in research reactors, several of which are over 50 years old and are approaching the end of their operating lives. Unanticipated and extended shutdowns of some of these old reactors have resulted in severe Mo-99 supply shortages in the United States and other countries. Some of these shortages have disrupted the delivery of medical care. Molybdenum-99 for Medical Imaging examines the production and utilization of Mo-99 and associated medical isotopes, and provides recommendations for medical use.
American Medical Isotopes Production Act of 2009 National Academies Press
Nearly 20 million nuclear medicine procedures are carried out each year in the United States alone to diagnose and treat cancers, cardiovascular disease, and certain neurological disorders. Many of the advancements in nuclear medicine have been the result of research investments made during the past 50 years where these procedures are now a routine part of clinical care. Although nuclear medicine plays an important role in biomedical research and disease management, its promise is only beginning to be realized. Advancing Nuclear Medicine Through Innovation highlights the exciting emerging opportunities in nuclear medicine, which include assessing the efficacy of new drugs in development, individualizing treatment to the patient, and understanding the biology of human diseases. Health care and pharmaceutical professionals will be most interested in this book's examination of the challenges the field faces and its recommendations for ways to reduce these impediments.
Medical Isotope Production Without Highly Enriched Uranium World Scientific
The book Radioisotopes - Applications in Bio-Medical Science contains two sections: Radioisotopes and Radiations in Bioscience and Radioisotopes and Radiology in Medical Science. Section I includes chapters on medical radioisotope production, radio-labeled nano-particles, radioisotopes and nano-medicine, use of radiations in insects, drug research, medical radioisotopes and use of radioisotopes in interdisciplinary fields etc. In Section II, chapters related to production of metal PET (positron emission tomography) radioisotopes, 3-dimensional and CT (computed tomography) scan, SS nuclear medicine in imaging, cancer diagnose and treatments have been included. The subject matter will by highly useful to the medical and paramedical staff in hospitals, as well as researchers and scholars in the field of nuclear medicine medical physics and nuclear bio-chemistry etc.
Medical Radionuclide Production John Wiley & Sons
A comprehensive, authoritative and up-to-date reference for the newcomer to radiopharmaceuticals and those already in the field. Radiopharmaceuticals are used to detect and characterise disease processes, or normal biological function, in living cells, animals or humans. Used as tracer molecules, they map the distribution, uptake and metabolism of the molecule in clinical studies, basic research or applied research. The area of radiopharmaceuticals is expanding rapidly. The number of PET centers in the world is increasing at 20% per year, and many drug companies are utilising PET and other forms of radiopharmaceutical imaging to evaluate products. * Readers will find coverage on a number of important topics such as radionuclide production, PET and drug development, and regulations * Explains how to use radiopharmaceuticals for the diagnosis and therapy of cancer and other diseases * The editors and a majority of the contributors are from the United States
Radioisotopes National Academies Press
Summarises the laboratory protocols developed over a three year period for the production of radionuclides using solid target technology, in particular thallium-201, iodine-123, iodine-124 and palladium-103, which are important radioisotopes for use in medical diagnosis and therapy.
Radioisotopes in Medicine Springer
This book provides a comprehensive treatment of cyclotrons, with a special emphasis on production of radionuclides. Individual

sections are devoted to accelerator technology, theoretical aspects of nuclear reactions, the technology behind targetry, techniques for preparation of targets, irradiation of targets under high beam currents, target processing and target recovery. This book will appeal to scientists and technologists interested in translating cyclotron technology into practice, as well as postgraduate students in this field.

Reduced Enrichment for Research and Test Reactors BoD – Books on Demand

This book is the product of a congressionally mandated study to examine the feasibility of eliminating the use of highly enriched uranium (HEU2) in reactor fuel, reactor targets, and medical isotope production facilities. The book focuses primarily on the use of HEU for the production of the medical isotope molybdenum-99 (Mo-99), whose decay product, technetium-99m3 (Tc-99m), is used in the majority of medical diagnostic imaging procedures in the United States, and secondarily on the use of HEU for research and test reactor fuel. The supply of Mo-99 in the U.S. is likely to be unreliable until newer production sources come online. The reliability of the current supply system is an important medical isotope concern; this book concludes that achieving a cost difference of less than 10 percent in facilities that will need to convert from HEU- to LEU-based Mo-99 production is much less important than is reliability of supply.

Cyclotron Produced Radionuclides Nuclear Energy Agency

Proceedings of an International Meeting, Petten, The Netherlands, October 14-16, 1985

Medical Isotope Production Without Highly Enriched Uranium Walter de Gruyter GmbH & Co KG

Comprehensive medical imaging physics notes aimed at those sitting the first FRCR physics exam in the UK and covering the scope of the Royal College of Radiologists syllabus. Written by Radiologists, the notes are concise and clearly organised with 100's of beautiful diagrams to aid understanding. The notes cover all of radiology physics, including basic science, x-ray imaging, CT, ultrasound, MRI, molecular imaging, and radiation dosimetry, protection and legislation. Although aimed at UK radiology trainees, it is also suitable for international residents taking similar examinations, postgraduate medical physics students and radiographers. The notes provide an excellent overview for anyone interested in the physics of radiology or just refreshing their knowledge. This third edition includes updates to reflect new legislation and many new illustrations, added sections, and removal of content no longer relevent to the FRCR physics exam. This edition has gone through strict critique and evaluation by physicists and other specialists to provide an accurate, understandable and up-to-date resource. The book summarises and pulls together content from the FRCR Physics Notes at Radiology Cafe and delivers it as a paperback or eBook for you to keep and read anytime. There are 7 main chapters, which are further subdivided into 60 sub-chapters so topics are easy to find. There is a comprehensive appendix and index at the back of the book.

Medical Isotopes Production Project (MIPP): Molybdenum-99 and Related Isotopes, Bernalillo County IAEA

The focus of this Special Issue is aimed at enhancing the discussion of Engineering Education, particularly related to technological and professional learning. In the 21st century, students face a challenging demand: they are expected to have the best scientific expertise, but also highly developed social skills and qualities like teamwork, creativity, communication, or leadership. Even though students and teachers are becoming more aware of this necessity, there is still a gap between academic life and the professional world. In this Special Edition Book, the reader can find works tackling interesting topics such as educational resources addressing students' development of competencies, the importance of final year projects linked to professional environments, and multicultural or interdisciplinary challenges.

Department of Energy's Isotope Production and Distribution Program International Atomic Energy Agency

This report explores the main reasons behind the unreliable supply of Technetium-99m (Tc-99m) in health-care systems and policy options to address the issue. Tc-99m is used in 85% of nuclear medicine diagnostic scans performed worldwide – around 30 million patient examinations every year. These scans allow diagnoses of diseases in many parts of the human body, including the skeleton, heart and circulatory system, and the brain. Medical isotopes are subject to radioactive decay and have to be delivered just-in-time through a complex supply chain. However, ageing production facilities and a lack of investment have made the supply of Tc-99m unreliable. This report analyses the use and substitutability of Tc-99m in health care, health-care provider payment mechanisms for scans, and the structure of the supply chain. It concludes that the main reasons for unreliable supply are that production is not economically viable and that the structure of the supply chain prevents producers from charging prices that reflect the full costs of production and supply.

Life Atomic MDPI

Radioactive isotopes and enriched stable isotopes are used widely in medicine, agriculture, industry, and science, where their application allows us to perform many tasks more accurately, more simply, less expensively, and more quickly than would otherwise be possible. Indeed, in many cases--for example, biological tracers--there is no alternative. In a stellar example of "technology transfer" that began before the term was popular, the Department of Energy (DOE) and its predecessors has supported the development and application of isotopes and their transfer to the private sector. The DOE is now at an important crossroads: Isotope production has suffered as support for DOE's laboratories has declined. In response to a DOE request, this book is an intensive examination of isotope production and availability, including the education and training of those who will be needed to sustain the flow of radioactive and stable materials from their sources to the laboratories and medical care facilities in which they are used. Chapters include an examination of enriched stable isotopes; reactor and accelerator-produced radionuclides; partnerships among industries, national laboratories, and universities; and national isotope policy.

Molybdenum-99 for Medical Imaging McGill-Queen's Press - MQUP

The complexity and vulnerability of the human body has driven the development of a diverse range of diagnostic and therapeutic techniques in modern medicine. The Nuclear Medicine procedures of Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT) and Radionuclide Therapy are well-established in clinical practice and are founded upon the principles of radiation physics. This book will offer an insight into the physics of nuclear medicine by explaining the principles of radioactivity, how radionuclides are produced and administered as radiopharmaceuticals to the body and how radiation can be detected and used to produce images for diagnosis. The treatment of diseases such as thyroid cancer, hyperthyroidism and lymphoma by radionuclide therapy will also be explored.

Isotopes for Medicine and the Life Sciences National Academies Press
The Third International Conference on Isotopes focused on the theme of “Isotope Production and Applications in the 21st Century” and included presentations by several eminent experts in this field. The three central subjects — Isotopes in Medicine, Industry and the Environment — were supplemented by presentations on the latest developments in isotope production and synthesis, research into radiopharmaceuticals, applications in agriculture, analytical applications, radiocarbon dating, AMS and PET. Various views on the future directions for producers and users of isotopes were considered at this multi-disciplinary meeting. Contents:Isotope Facilities and ProgramsRadiochemical Synthesis I–II, Nuclear Analytical Applications of Radioisotopes I–IIRadioisotope ProductionSeparation and Applications of Stable IsotopesIndustrial Applications and Radiation SafetyRadiopharmaceutical Applications and Medical Imaging I–IIProduction and Applications of Isotope Tracers in Industry I–IIUse of Isotopes in Environmental Studies I–IIApplications of Isotopes in Medical Imaging and TherapyRadiation Safety Aspects at Isotope FacilitiesApplications in Agriculture and NutritionAMS and Radiocarbon Dating TechniquesPoster SessionApplications of Isotopes in Environmental StudiesProduction and Applications of Short-Lived RadioisotopesLabeling Compounds and Other Applications of TritiumNovel Applications of Isotopes and Opportunities for Technology TransferClosing Plenary Session: “Isotope Production and Applications in the 21st Century” Readership: Radiochemists, radiopharmacists, environmental scientists, reactor and accelerator physicists, and nuclear medicine researchers. Keywords:
Isotope Production National Academies Press
Distributed to some depository libraries in microfiche.
Isotope Production and Applications in the 21st Century National Academies Press
The work describes the production technology of standard medical radionuclides using reactors and cyclotrons for patient diagnosis and therapy. A special focus lies on the science and technology involved in the development of novel radionuclides for positron emission tomography (PET) and internal targeted radiotherapy. The availability of those radionuclides is opening up new potential in clinical research, especially in neurology, cardiology and oncology. The future perspectives of the developing technology are also discussed.
Beneficial Uses and Production of Isotopes National Academies Press
In the late 1980s, the National Cancer Institute initiated an investigation of cancer risks in populations near 52 commercial nuclear power plants and 10 Department of Energy nuclear facilities (including research and nuclear weapons production facilities and one reprocessing plant) in the United States. The results of the NCI investigation were used a primary resource for communicating with the public about the cancer risks near the nuclear facilities. However, this study is now over 20 years old. The U.S. Nuclear Regulatory Commission requested that the National Academy of Sciences provide an updated assessment of cancer risks in populations near USNRC-licensed nuclear facilities that utilize or process uranium for the production of electricity. Analysis of Cancer Risks in Populations near Nuclear Facilities: Phase 1 focuses on identifying scientifically sound approaches for carrying out an assessment of cancer risks associated with living near a nuclear facility, judgments about the strengths and weaknesses of various statistical power, ability to assess potential confounding factors, possible biases, and required effort. The results from this Phase 1 study will be used to inform the design of cancer risk assessment, which will be carried out in Phase 2. This report is beneficial for the general public, communities near nuclear facilities, stakeholders, healthcare providers, policy makers, state and local officials, community leaders, and the media.
The American Medical Isotopes Production Act BoD – Books on Demand
Radioisotopes are used worldwide in a range of medical, industrial, research and academic applications. A large proportion of these radioisotopes are produced in particle accelerators, and the number of institutions that operate linear accelerators or cyclotrons and manufacture and distribute radiopharmaceuticals, for example, is significant and increasing. The production of radioisotopes using particle accelerators poses significant radiation hazards to workers, members of the public, and the environment when accelerators are operated without adequate radiation safety measures. This Safety Guide provides practical guidance for implementing radiation protection and safety measures in such facilities involved in the production and use of radioisotopes.

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