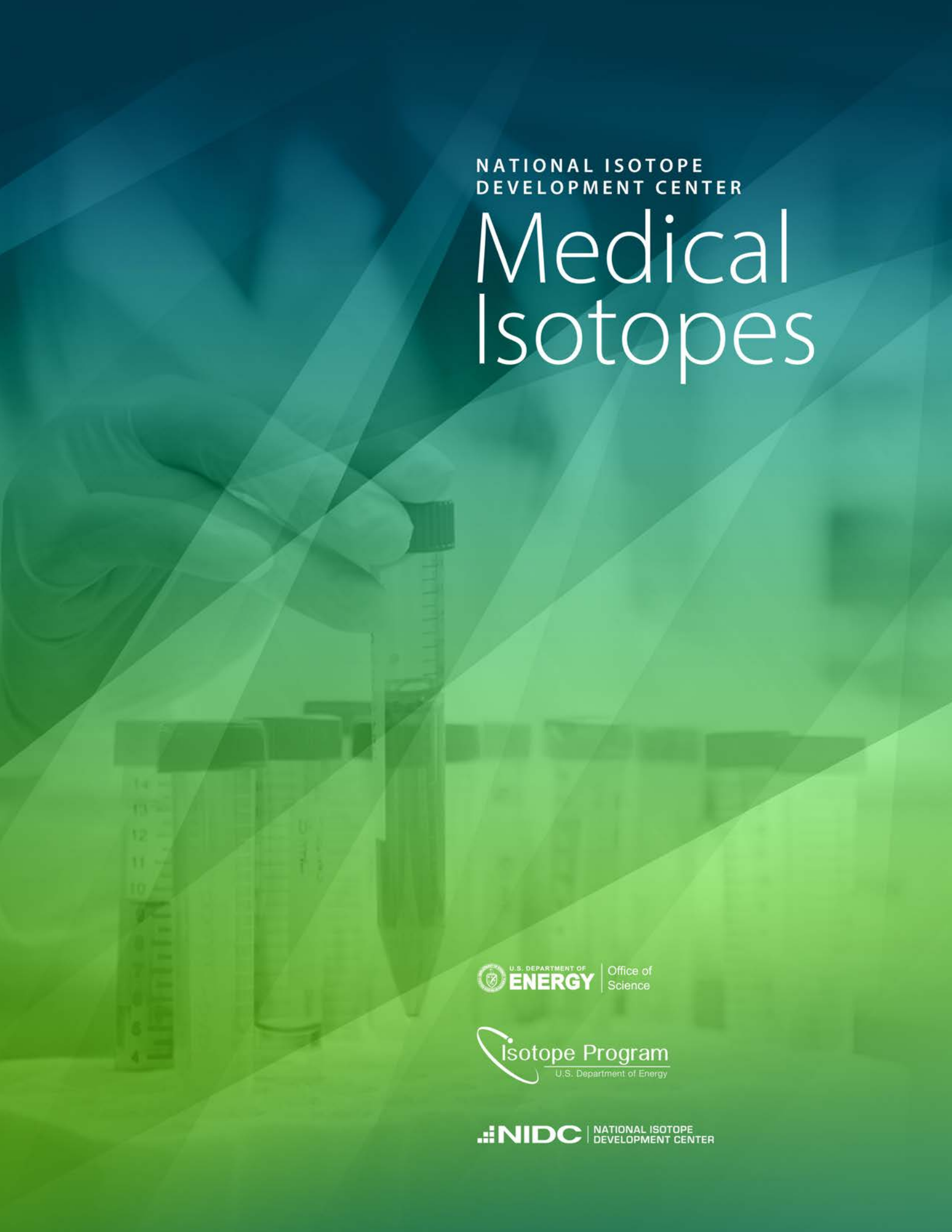
NATIONAL ISOTOPE
DEVELOPMENT CENTER

Medical Isotopes



U.S. DEPARTMENT OF ENERGY | Office of Science

Isotope Program
U.S. Department of Energy

NIDC | NATIONAL ISOTOPE DEVELOPMENT CENTER

Advancing Medical Innovation

The routine use of radioisotopes in the fields of biology, medicine, and pharmaceutical development has led to safer and more effective diagnoses and treatments of numerous medical conditions, including cancer and infectious disease. As a result, millions of patients worldwide have experienced improved health and quality of life.

Through an extensive network of national laboratories and partnering universities, the U.S. Department of Energy (DOE) Isotope Program develops, produces, and supplies isotopes that are critical components of these medical diagnostic and treatment options. Particle accelerators, research reactors, medical cyclotrons, and radiochemical processing laboratories are among the facilities that help the program meet this objective.

The DOE Isotope Program's portfolio has grown to include more than 35 medically relevant isotopes available through the National Isotope Development Center catalog (www.isotopes.gov), with several more under investigation at universities and national laboratories.

Medical Research

The development of new isotopes is critical to advancements in the medical field ranging from new molecular imaging agents to targeted radiotherapeutics. Additionally, new production methods that provide adequate supply and reduce costs are under constant pursuit.

Diagnostic Imaging

Some isotopes emit Some isotopes emit radiation that enables specialists to visualize the progression of disease throughout the body based on biological and physiological features. With these images, doctors can better assess how to treat the diseased tissue and can detect small cancers before they metastasize.

Combating Cancer and Infectious Disease

Certain radioisotopes serve as therapeutic agents by delivering highly targeted radiation to cancerous cells while sparing side effects to normal tissues. These radioisotopes are often administered by either direct infusion or attachment to targeting vehicles, like monoclonal antibodies or peptides.

Currently Available

ISOTOPE	HALF-LIFE	APPLICATION
Ac-225	10.0 d	Cancer therapy R&D (used directly or as the parent of Bi-213)
Ac-227	21.8 y	Cancer therapy
Al-26	717,000 y	Radiotracer
As-73	80.3 d	Radiotracer
At-211	7.21 h	Cancer therapy R&D (leukemia, lymphoma, multiple myeloma)
Au-199	3.14 d	Treatment of arthritis and cancer therapy
Be-7	53.2 d	Radiotracer
Cd-109	462 d	Diagnostic imaging
Cf-252	2.65 y	Cancer therapy
Co-60	5.27 y	Cancer therapy
Cu-67	2.58 d	Cancer therapy/diagnostics and planar imaging
Fe-52	8.28 h	PET imaging
Fe-55	2.74 y	Medical research
Ge-68*	271 d	Parent of Ga-68; PET imaging
Ir-192	73.8 d	Cancer therapy
Lu-177	6.65 d	Cancer therapy
Na-22	2.60 d	Radiotracer
Ra-224/Pb-212/Bi-212	10.6 h	Cancer therapy R&D
Ra-223	11.4 d	Cancer therapy
Re-186	3.72 d	Accelerator-based production for high specific activity; potential theranostic isotope
Se-72	8.40 d	Diagnostic imaging and generator for As-72
Se-75	120 d	Radiotracer
Sn-117m	14.0 d	Bone cancer pain relief
Sr-82*	25.3 d	Parent of Rb-82; PET imaging
Sr-89	50.6 d	Bone cancer pain relief
Te-123m	119 d	Diagnostic imaging
Th-227	18.7 d	Cancer therapy R&D
Th-228	1.91 y	Cancer therapy R&D
W-188	69.8 d	Parent of Re-188; cancer therapy R&D
Xe-127	36.4 d	Diagnostic imaging
Y-86	14.7 h	PET imaging
Y-88	107 d	Substitute for Y-90 in cancer R&D
Zn-65	244 d	Medical research

Under Development

ISOTOPE	HALF-LIFE	APPLICATION
Bi-205	15.3 d	Potential theranostic isotope
Ca-47	4.54 d	Radiotracer
Ce-134	3.16 d	Imaging analog for Ac-225
C-14	5,700 y	Radiotracer
Fe-59	44.5 d	Radiotracer
Gd-153	240 d	Brachytherapy and bone density measurement
Kr-76	14.8 h	Parent of Br-76; PET imaging
Mn-52	5.59 d	Bi-modal imaging
Nb-90	14.6 h	PET imaging
Pt-195m	4.01 d	Biomedical imaging
Re-189	24.3 h	Potential theranostic isotope
Rn-211	14.6 h	Parent of At-211; generator for At-211
Sc-47	3.35 d	Cancer therapy R&D
Te-119m	16.1 h	Parent of Sb-119; cancer therapy R&D
Ti-44	59.1 y	Parent of Sc-44; potential therapeutic isotope
U-230	20.8 d	Parent of Th-226; cancer therapy R&D
Xe-129	8.89 d	Lung imaging

***Back-up production to domestic producers only**

National Isotope Development Center

www.isotopes.gov

EMAIL: contact@isotopes.gov • **TELEPHONE:** (865) 574.6984 • **FAX:** (865) 574.6986