

DOE Isotope Program Releases Annual Update on Medical Isotopes

On October 14 the U.S. Department of Energy Isotope Program (DOE IP) released the *2020 Annual Update on Medical Isotopes*. The document details ongoing research, development, and production of medically relevant isotopes within the DOE IP and includes updates to program initiatives such as stable isotope production, isotope harvesting, nuclear data, and the University Isotope Network. The DOE Isotope Program supports production and associated techniques of radioactive and stable isotopes that are in short supply for research and other applications. A goal of the program is to make critical isotopes more readily available to meet domestic U.S. needs. The program coordinates and supports isotope production at universities, national laboratories, and commercial accelerator and reactor facilities throughout the United States to produce a reliable supply of domestic isotopes. Included are the medically relevant isotopes $^{225}\text{Ac}/^{213}\text{Bi}$, ^{227}Ac , ^{72}As , ^{211}At , ^{60}Co , ^{67}Cu , ^{177}Lu , $^{212}\text{Pb}/^{212}\text{Bi}$, ^{223}Ra , ^{227}Th , $^{228}\text{Th}/^{224}\text{Ra}$, ^{89}Sr , ^{90}Sr , $^{188}\text{W}/^{188}\text{Re}$, ^{86}Y , and ^{65}Zn . ^{99}Mo is not within the program's purview and is overseen by the National Nuclear Security Administration, a semi-autonomous agency within the DOE. The DOE IP also makes investments to develop new production and processing capabilities for critical isotopes.

The DOE IP is the only mission-essential program within the DOE Office of Science. Throughout the COVID-19 pandemic, the program's operations have been staffed and operational. Irradiations, processing, and purification operations continue, with shipments made to both domestic and international users.

Updates to DOE IP Initiatives

Enriched Stable Isotope Production. The DOE discontinued producing enriched stable isotopes in the Y-12 Plant calutrons (Oak Ridge, TN) in 1998. To reestablish this domestic capability, the DOE IP commissioned a prototype stable isotope enrichment plant at Oak Ridge National Laboratory (ORNL). Using an electromagnetic isotope separator (EMIS), it produced the world's only supply of ^{96}Ru . ORNL is now using the machine to develop methods for producing highly enriched ^{176}Yb for use in the production of no-carrier-added ^{177}Lu . Meanwhile, a small cascade of gas centrifuges was effective at enriching small quantities of ^{98}Mo and ^{100}Mo . The DOE IP is supporting a substantial scale-up of the prototype plant and has provided funds to

install several additional EMIS machines to expand production in the next few years. Starting in 2025, the Stable Isotope Production Facility will host an expanded centrifuge capability dedicated to producing enriched ^{129}Xe for hyperpolarized lung imaging. Further expansions are planned in the \$230-million Stable Isotope Production and Research Center at ORNL. With commissioning of the center planned around 2028, DOE will be capable of using multiple technologies and making multiple products simultaneously under 1 roof.

Facility for Rare Isotope Beams (FRIB) Isotope Harvesting. The DOE Office of Nuclear Physics is constructing the FRIB at Michigan State University (East Lansing). The DOE IP will establish isotope harvesting there to provide large quantities of rare isotopes starting around 2024.

Nuclear Data. The accelerators at Brookhaven National Laboratory (BNL; Upton, NY) and Los Alamos National Laboratory (LANL; NM) both recently underwent upgrades to increase production and analytical capabilities. A collaborative effort of BNL, LANL, and Lawrence Berkeley National Laboratory (CA) is underway to provide nuclear data of importance to the isotope community and allow the DOE IP to take full advantage of improvements to increase production yields at these facilities.

University Isotope Network (UIN). Two universities were selected for research funding in FY 2019 and an additional 4 for FY 2020 to encourage development of routine isotope production capabilities or production-related technologies. These awards aim to bolster DOE IP efforts to establish a regional production network for short-lived medically relevant isotopes or boutique isotopes for which there are no commercial suppliers.

Also detailed in the annual DOE IP report were updates on individual α -emitters, emerging isotopes, newly available isotopes, isotopes under development, and other routinely available medically relevant isotopes (including diagnostic, therapeutic, and theranostic combinations).

For more information on the availability of current or new isotopes contact the National Isotope Development Center at contact@isotopes.gov. For a full list of isotopes produced by the DOE IP and to request a quote, see www.isotopes.gov. Signing up at www.isotopes.gov/subscribe allows users to receive announcements and newsletters from the DOE IP, focusing on information about isotope availability, DOE IP funding opportunity announcements, and breaking news.