CYCLOTRON INSTITUTE
TEXAS A&M UNIVERSITY

http://cyclotron.tamu.edu

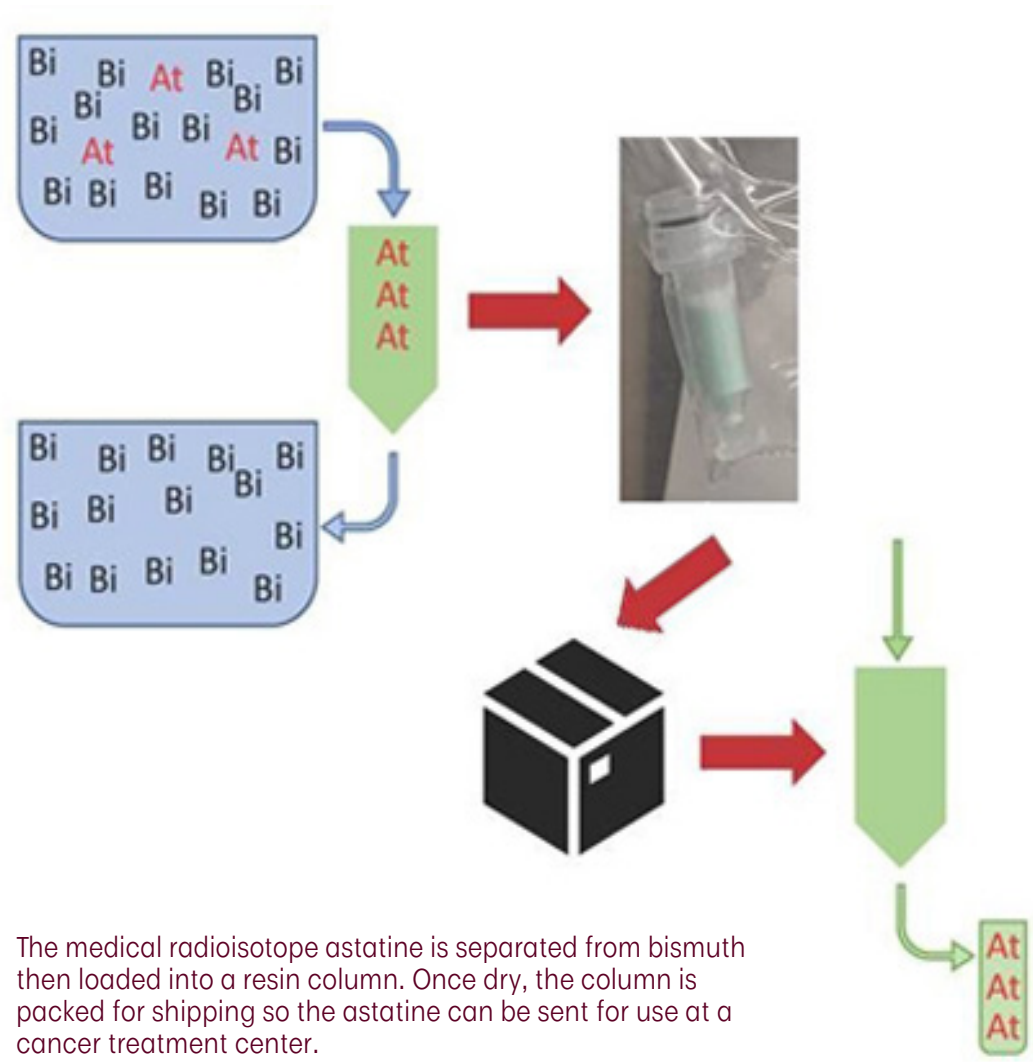
Cancer Countermeasures on a Column

Researchers produce a novel method of shipping the promising medical isotope astatine-211 used in targeted cancer treatment

THE SCIENCE
Researchers supported by the DOE Isotope Program are studying the isotope astatine-211 (At-211) for a new cancer treatment called targeted alpha therapy. This type of treatment may do more damage to cancer cells and cause less harm to the rest of the body than current cancer therapies because it emits alpha particles. Alpha particles deposit a large amount of energy in a small volume of tissue. Researchers have now developed a novel method of separating and shipping At-211. The method separates radioactive At-211 from nonradioactive bismuth, where At-211 is present at the level of 1 in 35,000,000 atoms. The At-211 is then loaded into a column made of resin for delivery to a cancer center.

THE IMPACT
In an advance for cancer treatment research, scientists have produced At-211 quickly then shipped a small amount of the radioisotope in a safe and secure package to a cancer research center. The radioisotope can be directly "milked" from the resin shipping column as part of incorporating At-211 into a targeted alpha therapy drug. The new resin column trapping approach will allow isotope producers to ship larger quantities of At-211 with less risk and less loss of the isotope to decay than with current methods. This helps to promote the feasibility of At-211 as a next-generation powerhouse for effective treatment of cancer.

SUMMARY
Texas A&M is one of about 30 sites in the world where At-211 can be produced. Because of the short half-life of the radioisotope, it is essential to reduce the time between production and patient treatment. The novel chemistry developed at Texas A&M for At-211 allows for the extraction of the At-211 out of a solution containing a dissolved At-211 target. The incorporation of At-211 into a resin-packed column makes this chemistry rapid and very efficient. Once the At-211 is attached to the resin, the column can be dried and shipped. This new modality of shipping the radioisotope on the dried column enables safer shipping as the radioisotope is immobilized on a solid substrate. This approach also allows for re-purification of At-211 immediately before use, thus removing any bismuth decay product that accumulated during shipping. This allows for the potential use of different "milking" agents that can be tailored to different chemistry. At-211 is available through the DOE Isotope Program at www.isotopes.gov.



The medical radioisotope astatine is separated from bismuth then loaded into a resin column. Once dry, the column is packed for shipping so the astatine can be sent for use at a cancer treatment center.

Jonathan D. Burns

Sherry J. Yennello

PUBLICATIONS
Burns, J.D. et al. "Rapid recovery of At-211 by extraction chromatography," Sep. Purif. Technol. 256, 117794 (2021).

Yennello, S.J. et al. "Advances in 211At production at Texas A&M University," EPJ Web of Conferences 252, 03002 (2021).

FUNDING
This work was supported by the U.S. Department of Energy Isotope Program managed by the Office of Science for Isotope R&D and Production; by Texas A&M University through the Bright Chair in Nuclear Science, the Nuclear Solutions Institute, and a T3 grant; and by the Texas A&M University System NationalLaboratories Office and Los Alamos National Laboratory through the joint colloborative reserach program.

ABOUT THE CYCLOTRON INSTITUTE: *Dedicated in 1967, the Cyclotron Institute serves as the core of Texas A&M University's accelerator-based nuclear science and technology program. Affiliated faculty members from the Department of Chemistry and the Department of Physics and Astronomy conduct nuclear physics- and chemistry-based research and radiation testing within a broad-based, globally recognized interdisciplinary platform supported by the United States Department of Energy (DOE) in conjunction with the State of Texas and the Welch Foundation. The facility is one of five DOE-designated Centers of Excellence and is home to one of only five K500 or larger superconducting cyclotrons worldwide.*