

60th Anniversary of ^{99m}Tc Generator Celebrated at BNL

On November 7, scientists, staff, and guests at the Department of Energy Brookhaven National Laboratory (BNL; Upton, NY) celebrated the 60-year history of the invention and development of the ^{99m}Tc generator. BNL chemists Walter Tucker and Margaret Greene developed the first generator in 1958, and in 1960 Powell “Jim” Richards at BNL was the first to promote the use of ^{99m}Tc in medical imaging. Today the radioisotope is used in 80% of the world’s radiopharmaceutical imaging procedures, according to a BNL press release on the celebration of the generator’s anniversary. The ability to produce ^{99m}Tc at the site of intended use revolutionized the geographic scope and availability of nuclear medicine imaging.

In the late 1950s, members of the Hot Division Lab in which Tucker and Greene worked were trying to develop a generator to separate ^{132}I from its parent tellurium. Although other iodine isotopes could be used to treat thyroid cancer, the researchers were interested in advantages that might accrue to a radioisotope with a shorter half-life. An unexpected impurity encountered in the separation process turned out to be molybdenum, which they found decayed into ^{99m}Tc . The similarities in chemistry between iodine/tellurium and technetium/molybdenum prompted Tucker and Greene to create a generator for technetium.

The challenge, however, was the lack of practical uses for either ^{99m}Tc or the generator. Richards, who was in charge of radioisotope production at BNL, led a group whose main interests were in potential medical applications of radioisotopes. Richards believed ^{99m}Tc could be useful in a range of imaging procedures. Together with fellow BNL scientist Suresh Srivastava, PhD, he began attending and giving talks on its potential in nuclear medicine. “Jim’s first talk on ^{99m}Tc was in 1960 at a nuclear medicine con-



Brookhaven National Laboratory chemist Margaret Greene played a prominent role in development of the original ^{99m}Tc generator, shown here. *From Brookhaven National Laboratory.*

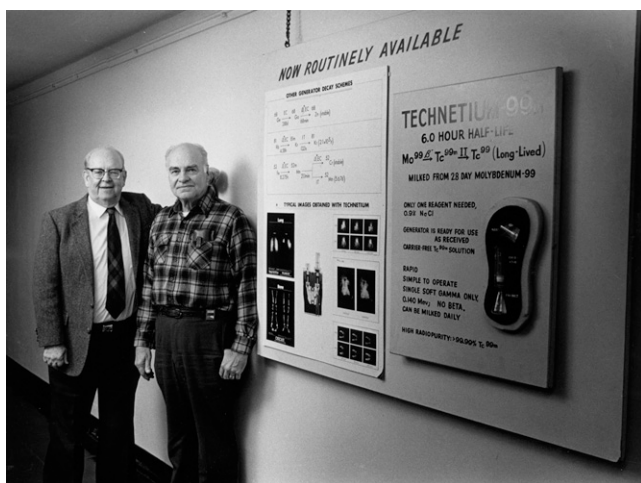
ference in Italy, where he was able to astound the whole audience,” said Srivastava. In the same year, Richards was the first to convince a physician to try technetium as an agent for medical imaging.

In an article released prior to the anniversary celebration, Allison Gasparinich noted that the “moly cow” (as the columned ^{99m}Tc generators were long known) was not an instant success. When the team at Brookhaven applied for a patent on the generator’s design, the U.S. Patent Office replied: “We are not aware of a potential market for ^{99m}Tc great enough to encourage one to undertake the risk of patenting.”

Later, Brookhaven scientists would address one of the initial problems with thousands of users generating and compounding their own in-house ^{99m}Tc agents. ^{99m}Tc must be bound to a pharmaceutical drug that carries the radionuclide to specific targets, and different radiochemists at different sites used widely varying techniques and formulae. As a result, imaging from 1 hospital (and sometimes from the same hospital on different days) could not be reliably compared, impeding both comparison of images and confidence in accurate interpretation. Such inconsistencies also affected researchers’ abilities to evaluate the results of clinical trials across multiple institutions. BNL scientists then developed a method for packaging all the elements needed to combine with locally generated ^{99m}Tc in a single, easy-to-use kit. Today the “shake-and-bake” kit is a standardized part of nuclear medicine imaging and assessment across a range of anatomic sites and diseases.

Among the presenters and topics at the November 7 symposium were: Srivastava, “The story of ^{99m}Tc : history and impact worldwide”; William Eckelman, PhD, “Instant kits: from before ^{99m}Tc -DTPA to ^{99m}Tc -tilmanocept”; John Babich, PhD, “ ^{99m}Tc radiotracers: from nonessential to essential”; and Cathy Cutler, PhD, “Future research at Brookhaven and the development of ^{225}Ac .”

Brookhaven National Laboratory



Walt Tucker (left) and Powell “Jim” Richards (right) pioneered ^{99m}Tc generator research in the 1950s at Brookhaven National Laboratory. *From Brookhaven National Laboratory.*