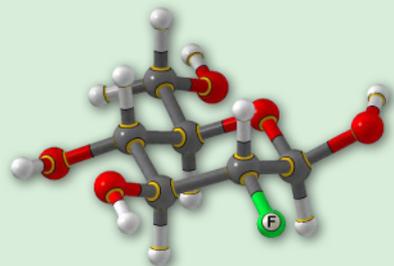




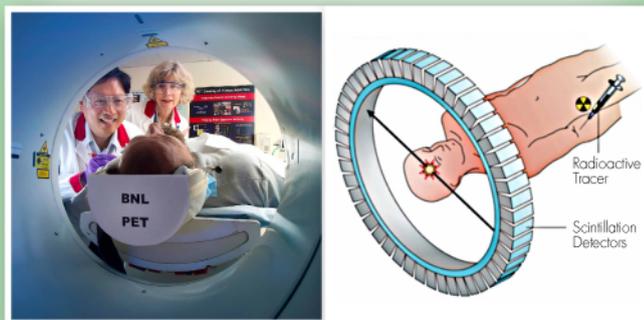
Brookhaven Lab chemist Joanna S. Fowler with an early ^{18}F DG synthesis apparatus.



Molecular structure

2-deoxy-2-[^{18}F]fluoro-D-glucose, or ^{18}F DG, travels to and accumulates wherever glucose (energy) is being used, enabling imaging of metabolic activity in the brain and body, including in tumors.

Chem-Ray Picture by Joseph Lauher, Stony Brook University



PET scanner

Positron emission tomography (PET) creates pictures by retracing the paths of back-to-back gamma rays emitted when positrons from radio-tracers like ^{18}F DG interact with electrons in the body.



1976



Chemistry Building at Brookhaven Lab Named Historic Chemical Landmark

The New York Section of the American Chemical Society recognizes Brookhaven's Chemistry Department for the synthesis of ^{18}F DG, a radio-tracer that has had a revolutionary impact on brain research and on cancer diagnosis and management.



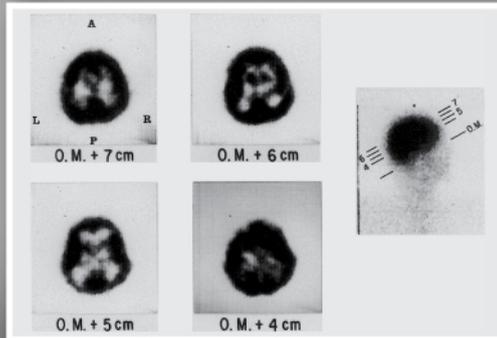
First synthesis of ^{18}F DG at Brookhaven Lab

Left to right: Tatsuo Ido, Chung Nan Wan, Alfred P. Wolf



First ^{18}F DG scan at University of Pennsylvania using David Kuhl's Mark IV scanner

Left to right: Martin Reivich, Joel Greenberg



First ^{18}F DG brain images showing high metabolic activity in gray matter

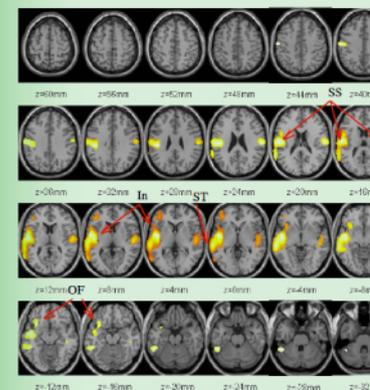
^{18}F DG is now the standard radiotracer used for PET neuroimaging and cancer diagnosis, with more than 1.5 million ^{18}F DG PET scans performed annually. This discovery opened a window into the study and diagnosis of:

- drug and alcohol addiction
- epilepsy
- obesity and eating disorders
- coronary artery disease
- attention deficit hyperactivity disorder (ADHD)
- neurodegenerative diseases such as Alzheimer's
- lung, breast, and other cancers



Drug addiction

^{18}F DG PET scans indicate that drug abusers have impaired function in the frontal cortex (the brain's decision-making center) compared to healthy control subjects.



Obesity

^{18}F DG PET scans, superimposed on magnetic resonance imaging (MRI) scans, highlight brain regions that were more active when subjects were shown their favorite foods.



Cancer

Because tumor cells are constantly dividing, they consume large amounts of glucose, causing them to light up on ^{18}F DG PET scans. These changes can be detected early, and can also help monitor patients' response to treatment. This scan shows lung cancer metastasized from ovarian cancer.

Image from Michael Phelps, UCLA

