

The Isotope Market Is Changing, and It Really Matters

Most people don't know what isotopes are, and it doesn't really matter. What DOES matter is that they understand just how vital they are to our daily lives—AND that the war in Ukraine has placed the world supply of isotopes in jeopardy.

The US Department of Energy's Website has a unique way of explaining isotopes.

"A family of people often consists of related but not identical individuals. Elements have families as well, known as isotopes. Isotopes are members of a family of an element that all have the same number of protons but different numbers of neutrons," [according to the DOE site](#). "The addition of even one neutron can dramatically change an isotope's properties. Carbon-12 is stable, meaning it never undergoes radioactive decay. Carbon-14 is unstable and undergoes radioactive decay with a half-life of about 5,730 years (meaning that half of the material will be gone after 5,730 years). This decay means the amount of carbon-14 in an object serves as a clock, showing the object's age in a process called 'carbon dating.'"

But the science is less important than the uses of isotopes. Radioactive isotopes have applications in agriculture, food processing, pest control, archaeology, and medicine.

For instance, if you've ever gone to the doctor and had him perform any kind of diagnostic testing, you've interacted with isotopes. Technetium-99m is the most commonly used radioactive pharmaceutical in nuclear medicine diagnostic studies. They are used for brain, bone, liver, spleen, and kidney imaging, as well as blood flow studies, in which various chemical forms are used, [according to Byju's](#), an Indian multinational educational technology company, headquartered in Bangalore, that teaches multiple courses on isotopes.

More examples include:

- Americium-241—Many smoke detectors for homes and businesses use this material to assess toxic lead levels in dried paint samples to ensure uniform thickness in rolling processes such as steel and paper manufacturing as well as to assist in determining where oil wells should be drilled.
- Californium-252—Used to inspect airline luggage for hidden explosives, to determine the moisture content of soil in the road and building industries, and to measure the moisture of materials stored in soils.
- Caesium-137—Used to treat cancerous tumors, to measure correct patient doses of radioactive pharmaceuticals, to measure and control liquid flow in oil pipelines, to tell researchers whether oil wells are plugged by sand, and to ensure the proper fill level for packages of food, drugs, and other products.

Many of these isotopes are critical for healthcare professionals, and according to one CEO in the isotope space, the market is changing dramatically, and not necessarily for the better.

"Nine out of 10 suppliers of Molybdenum 99—the most commonly used radioisotope in nuclear medicine—are expected to cease production due to aging reactors," said Paul Mann, CEO of ASP

Isotopes. “What’s worse is that, up until this year, much of the world’s supply of isotopes came from Russia. That pipeline, as you might imagine, is no longer reliable.”

ASP Isotopes utilizes technology developed in South Africa over the past 20 years to enrich isotopes of elements or molecules with low atomic masses. Many of these elements are unsuitable for enrichment using traditional methods such as centrifuges. The company's first commercial product will be Molybdenum 100, which has the potential to replace Molybdenum 99, a commonly used product in the diagnostic imaging market.

According to Mann, the global market for Molybdenum 99 is currently about \$30 billion, so a replacement for Molybdenum 99 could fill the gap in availability.

But Mann also sees the crisis as an opportunity.

“The isotope market is at an inflection point,” Mann said. “On one hand, the need is greater than ever. We have plants that are literally sold out for the next two years because of the demand. That said, the market needs present a once-in-a-generation opportunity for innovation, to craft new ways of separating isotopes that are environmentally friendly and reduce our carbon footprint. That’s where we believe the market is heading, and we want to lead, not just follow.”