

Life-saving Medical Isotopes

With almost 10 million deaths each year, cancer is the second-leading cause of death globally. In the United States, alone, nearly 2 million cancer cases are reported annually. The good news is that treatment advances, which have led to improved cancer outcomes, are quickly gaining speed.

After 100 years of using radiation externally to treat cancer, there is a revolution in the field of radiation oncology, thanks to new approaches in radioisotope technology that have the power to dramatically improve options for cancer treatment. Serva Medical is part of this revolution.

Using their suite of Smart Nuclear Materials, Serva is developing new, more efficient pathways to produce life-saving radioisotopes that can be used as part of a targeted antibody therapy to treat a variety of diseases, including cancer.

When linked to target molecules (e.g., antibodies and peptides), radioisotopes become a powerful radiopharmaceutical that targets and destroys specific cancer cells while leaving healthy cells untouched. In this way, radiopharmaceutical drugs are transforming how we use radiation to treat cancer.



🗇 SERVAENERGY

Rather than bombarding the body with external radiation, causing damage to healthy tissue, targeted alpha therapy can now selectively direct radiation — acting as a kind of tracking device seeking out and destroying cancer cells exclusively.

The Cancer-fighting Potential of Actinium-225

Actinium-225 (²²⁵Ac) is a targeted alpha therapy isotope emitting alpha particles that deliver a short range but high-energy radiation, offering an ideal combination that kills cancer cells without harming nearby healthy cells.

Pharmaceutical companies are investigating ²²⁵Ac as a potential treatment for several of the deadliest cancers worldwide that were responsible for over 6 million deaths in 2019. Early studies show tremendous promise — in some cases, effectively eliminating cancer in as little as three treatments.



Before and after 3 doses of Actinium-225



The Problem with Actinium

Research and production of new radiopharmaceuticals have been severely constrained by supply limitations. Increasingly known as "the rarest drug on earth," most of the supply has come from processing nuclear waste. Recent efforts have focused on using high-power accelerators to develop new production methods, but to date there are no major commercial producers outside of national labs.

- Current global supply of ²²⁵Ac stands at **1.7 Curies** (Ci) per year enough for fewer than 5,000 doses.
- The Department of Energy estimates that to fully support clinical trials of new cancer treatments, it would require a global supply of **50 Ci per year**.
- With the projected approval of a number of forthcoming drugs that demand ²²⁵Ac, global supply needs could easily rise to the hundreds of Ci per year.

How Serva Can Help

Having built specialized tools and techniques for mapping the nucleogenesis of radioisotopes in commercial reactors over extended periods of time, Serva Energy is now applying these same innovative technologies with great effect to identifying new production methods for the most critically needed isotopes.

Serva has identified a novel reactor-based production method for developing ²²⁵Ac using a proprietary fusionfission hybrid process. Experimental validation is underway with a proof of concept expected by early 2023. Given the greater neutron economy of even lower-flux reactors, this method is expected to produce significantly higher levels than other existing or proposed methods.

These advancements are on the threshold of a new generation of cancer treatment.

Sarah Jones, Ph.D.

Vice President Serva Medical S.jones@servaenergy.com www.servaenergy.com

SERVAENERGY